OULUN YLIOPISTO
UNIVERSITY of OULU

OULU BUSINESS SCHOOL

RIKU SILJANDER

EXPLORING SOFTWARE SOLUTIONS FOR ANALYZING VOLUNTARY ENVIRONMENTAL REPORTING PRACTICES AMONG LISTED CORPORATIONS

Master's Thesis
Department of Accounting
January, 2021

ACKNOWLEDGEMENTS

One has to be humble and give thanks. None of this would have been possible without the relentless efforts of an extremely talented, young software developer with an outrageously bright future ahead of himself.

Thank you, Rasmus, for your invaluable assistance throughout the project.

UNIVERSITY OF OULU
Oulu Business School

ABSTRACT OF THE MASTER'S THESIS

Unit			
Department of Accounting			
Author		Supervisor	
Riku Siljander		Janne Järvinen	
Title			
Exploring software solutions for analyzing voluntary environmental reporting practices among listed corporations.			
Subject	Type of the degree	Time of publication	Number of pages
Laskentatoimi	Master's Thesis	2021	107

Abstract

The lack of comparable, objective and verifiable results in environmental reporting research calls for novel solutions. This thesis seeks to explore the possibilities of automation when it comes to analyzing corporate sustainability reporting. Specifically, we design and create a highly objective way of analyzing, scoring and ranking the environmental reports of companies – both in terms of quantity and quality – via an automated, novel, Python-based software solution. Additionally, empirical analysis is conducted with key company-specific determinants (size, profitability, leverage, industry affiliation and board composition) to determine which factors affect the quality and quantity of sustainability reporting among Finnish listed corporations. Being highly novel, this thesis can be characterized as a methodological study, and as such, the process and outcomes of creating the methodology in hand act as findings for the thesis. This thesis finds that it is indeed possible to successfully create a software which fulfills said criteria. Findings for key determinants are limited; statistically significant determinants only include board composition and size.

Keywords
GRI, sustainability reporting, python, CSR, voluntary reporting

Additional information

CONTENTS

1 INTRODUCTION

The free market system of business activities has arguably been the number one source of prosperity during the modern era of human evolution. As everything in life – and in science – though, no solution is perfect. During the past decade, the free-market system has been criticized for its lack of focus on sustainability issues, and later on, for its tendency for approaching sustainability-related matters in somewhat fraudulent ways. In western social systems, governments and other bodies have usually intervened and set healthy parameters for the activities of organizations. However, it can justifiably be stated that legislative support for sustainability issues has been lackluster. Although increasingly scarce, examples of shortcomings remain.

Amidst the realm of sustainability, voluntary reporting practices have been proposed – and implemented – as remedies for issues arising from the information asymmetry between companies and their stakeholders. During times of extreme globalization, in a world affected by global warming, sustainability reporting[1] practices act as ways by which companies may disclose their responsibilities and report on their accountability. By informing a large group of varying stakeholders of its environmental impacts, a company may be able to generate acceptance – as opposed to disdain – among the society in large, as long as it is able to demonstrate that it understands, conforms and acts according to the responsibilities society places on the company. (Bouten, Everaert, Liedekerke, De Moor & Christiaens. 2011.)

Where shortcomings still widely exist, is sustainability reporting in practice. As no mandatory framework exists, there is little coherency in the quality, style or depth of

[1] The terms *environmental reporting*, *sustainability reporting, ecological reporting* and *CSR* are used rather interchangeably when referring to reporting on environmental issues. Please note that this study does not consider the social or economic factors related to CSR.

reporting. Combatting the heavily sporadic field of sustainability reporting practices, various models for have emerged during the past decades, perhaps the most prevalent of which is the Global Reporting Initiative (GRI) (Raucci & Tarquino, 2015). Widely adopted, the GRI is regarded as one of the main standards of corporate social responsibility (CSR) reporting. Frameworks such as the GRI offer suggestions as to the style, depth and contents of reporting but often fail to address issues relating to reporting quality. Granted, the quantity – i.e., depth of reporting – may also offer scholars a decent indication of the quality of reporting via a *quantity substituting quality* -approach, which is outlined by Unerman (2000), who argues that the volume of disclosure is reliant on the relative importance of the disclosure in hand. Regardless, unequivocal measures of quality seem to elude general recognition.

1.1 Scope, Aims & Research Gap

The main issues concerning studies on environmental reporting revolve around the subjective nature of analyzing such documents. That is, factors such as proclivity towards certain styles of writing, the subjective sense of reporting breadth and the assumptions of the researchers themselves are bound to affect the ways in which reporting quality and quantity are perceived. Furthermore, in manual analysis, researchers may have the tendency to perceive a report as higher, or lower quality, depending on its length. Finally, one is also drawn into comparisons between environmental reporting and other end-of-year reports. Where the legislative backing, historical significance and convention all underline the importance of creating comparable, verifiable and informative financial reports, such motivations do not exist in the field of sustainability reporting.

Therefore, the ultimate goal of this thesis is to study reporting practices in a way that these shortcomings are mitigated. In attempting to do so, it was determined that a software solution would be necessary. However, it became abundantly clear that finding a solution that matches the specific requirements of this thesis is extremely difficult, if not impossible. Researchers have attempted to create software-based methods in the past, but of the papers studied for this thesis, none seem to provide a comprehensive explanation of the specific actions and steps they have taken in order

to create the software. Similarly, while numerous retail software solutions were explored for use in this thesis, none seemed to be a great fit.

While studies that utilize sophisticated software solutions often offer valuable results – i.e., data that is unattainable with other methods – the problem arises from the fact that most of these studies fail to provide simplistic explanations for the steps they have taken to design the software. What this inevitably results into, is that fellow scholars who lack deep understanding of computer programming, are wholeheartedly unable to assess and analyze the results obtained from these studies. Without deep understanding, scholars are forced to take the researchers word as gospel as to the validity of the research method.

Empirically, this thesis has two points of focus: the determinants of reporting *quality* and the determinants of reporting *quantity*. Due to the highly subjective nature of quality measures, extant literature is often limited to analyzing the quality of reporting practices by using the quantity of reporting as its proxy. Using GRI frameworks as a baseline, this study seeks to fill this gap by forming a highly objective, semi-automated model by which to measure reporting quality and quantity as separate entities in order to better understand the contingent effects of both. While content analyses have been conducted in empirical research, such studies have generally been done manually. Of the studies utilizing software-based frameworks, extremely few attempt to outline used coding structures in ways that make the study accurately reproducible. Thus, this thesis aims to provide a breath of fresh air to the field by attempting to create a simple, well-functioning, automated software solution for analyzing the content of environmental reports – a path that has not often been embarked upon.

Therefore, the first, distinct point of focus of this thesis is to explore the possibilities of automation when it comes to analyzing corporate sustainability reporting. Specifically, this thesis attempts to design and create a highly objective way of analyzing, scoring and ranking the environmental reports of companies – both in terms of quantity and quality – via an automated, novel, Python-based software solution. In this sense, the main areas of importance for the software are A) enabling comparability between reports, B) the unconditional objectivity of analysis and C) ensuring the ability to analyze large quantities of reports simultaneously. As such, therefore, this

thesis could be characterized as *methodological research*, **where the methodology itself acts as one of the main findings of the study.**[2]

On a more general level, this thesis explores the environmental components of the social contracts between companies and their stakeholders, as well as their commitments to society at large. Specifically, the scope of this study is limited to environmental reporting, and the determinants which influence the quantity and quality of reporting among Nordic listed companies. While CSR reporting has been studied widely, it seems that there is a gap in research when it comes to addressing environmental reporting in particular. Focusing on a single component of corporate social responsibility – as opposed to analyzing the concept as a whole – offers an in-depth look into the specific implications of environmental sustainability and may offer differing explanations (determinants) as to why certain companies report more extensively than others. Additionally, as is shown, empirical evidence on the effects of the drivers of sustainability reporting performance remain inconclusive, which further highlights the necessity for further research.

Empirically, a research gap is also evident in terms of geographical scope. Studies on environmental reporting have been conducted both in national and international settings, but the Finnish operational setting seems to have been left largely untouched thus far. The geographical scope of the study may be able to provide unique insight in many ways: the Finnish stock market operates with a relatively low market capitalization on an international scale and has been shown to offer above-average returns historically (Heikkilä, 2019). As it often is, culturally distinct geographical locations may be able to offer distinct results, and the highly developed economy and established equity markets of Finland may be able to offer unique insight into the drivers of sustainability reporting. It will be interesting to see whether the unique characteristics of the market affect the obtained results.

[2] Research note: the implications of adopting a methodological research approach is that – while empirical analysis is indeed partly evident in the thesis – the methodology itself is the main focus. Thus, this thesis arguably fails to fit traditional thesis formats in a number of ways; after all, the findings are of secondary importance in relation to the process and methodology itself.

Research questions are as follows:

A: Can software-based solutions be utilized in studying voluntary corporate sustainability disclosures – and more specifically, can these be effectively used to analyze the content of sustainability reports – in order to obtain comparable, objective and verifiable data?

B: How do company-specific determinants affect the quality and quantity of environmental reporting among Finnish, listed corporations?

The study can be divided into three parts. The first part consists of a literature review and outlines the theoretical framework for the rest of the study. Second, quantity and quality assessment models will be formed based on extant literature, and finally, obtained data will be analyzed empirically.

2 LITERATURE REVIEW

2.1 Overview: Sustainability Reporting

Corporate social responsibility – once a buzzword, which eventually evolved into a trend – is now an area of business activity, that is inseparably a part of everyday corporate life. At its roots, CSR is a form of voluntary regulation done by companies in order to ensure transparency and to fulfill their responsibilities to the society at large. While there has been some uncertainty of the meaning of CSR during its infancy, where the concept was in vogue (Crowther, 2003), today, scholars seem to have agreed on its basic principles, as described by Gray et al. (1995): "*CSR literature identifies four major themes for CSR: natural environment, employees, community and customers*". In hindsight, the integration of these principles to the operational environment of companies can be considered successful, regardless of the varying extent of compliance in practice. Social contracts exist between companies and the societies they operate in, and because of this, CSR compliance has become the *de facto* standard, as well as a crucial strategic matter, rather than a buzzword or a trend.

During times of growing environmental turmoil – and complementing environmental protection attempts – businesses are scrutinized at increasingly higher levels. Businesses are inseparably linked and bound by the environments they live in. Environmental disasters affect company cash flows (Blanco et al., 2009), business-related environmental hazards have had adverse effects on ecosystems and health (Madsen, 2009) and business-inflicted environmental disasters seem to result into lowered market values throughout entire sectors (Capelle, Blancard & Laguna 2010). A great example of the interconnected nature of the environment and market can be found in the BP oil spill in 2010, where the company's share value halved, and volatility increased rapidly (Boudreaux, Rao, Das & Rumore, 2013). The pressure on companies to perform in environmentally friendly ways is growing, even though pressure from environmental groups may have declined slightly; consumers, employees and investors all seem to have increased interest towards the environment (Dixon et al. 2004).

Given these circumstances, it is evident that sustainability has become a key strategic target for a majority for companies. Environmental performance has also been found to have links to the financial performance of the company, and as such, it is not a surprise that stakeholders place increasingly higher performance on sustainability issues (UNCTAD, 2000). With such external pressure, companies have started to disclose potential – and materialized – environmental risks to a greater extent; as of 2017, approximately 93% of G250[3] companies reported on corporate responsibility (KPMG, 2017).

2.1.1 Truthfulness and quality of sustainability disclosures

Naturally, when assessing the quality and quantity of sustainability reports, addressing the definitions of each parameter is of utmost importance. As per Leuz and Wysocki's (2008) definition of favorable qualities for financial disclosures, this thesis considers comparability, verifiability and reliability as the most important indicators of sustainability disclosure quality. According to Hummel and Schlick (2016), high-quality reporting is generally associated with the complete disclosure of relevant and comparable data in a manner that matches – or preferably exceeds – the posted requirements for such disclosures.

These indicators of quality come with their fair share of assumptions. While it is relatively straight forward – by way of utilizing solid framework – to determine whether requirements are met, other indicators require deeper thought. In the context of this thesis, comparability stems from an organization offering some form of standardized measure suitable for comparison both within a given organization (i.e. year-to-year measures) and from one organization to another. These measures seem to most frequently present themselves numerically; for example, through relative metrics such as percentages.

[3] Refers to the world's 250 largest companies by revenue based on the Fortune 500 ranking of 2016 (KPMG, 2017).

Slight problems arise when scholars are to verify the nature and reliability of disclosures. After all, one would have to have full access to the companies' operations and sustainability data to do so in an unequivocal manner. Therefore, scholars conducting a qualitative, deductive study are forced to rely on certain assumptions to ensure the reliability and verifiability of disclosures. Specifically, scholars rely on the suggestions of *voluntary disclosure theory*, in that it is assumed that companies with high real-life sustainability performance will choose to disclose sustainability information at exceptional quality to distinguish themselves from inferior performers. It is also assumed that inferior performers are not able to mimic these reports without incurring costs that would make such reporting unreasonable. In other words, superior sustainability performers will attempt to signal the quality of their operations – which would otherwise be unobservable to third parties – through high quality disclosures, and if such unobservable performance does not exist (i.e., poor performer), it is extremely difficult to create sustainability reports which would signal high quality operations. Adopting this line of thought, it is safe to argue that disclosures remain relatively reliable, as untruthful reporting has to be seen as unlikely. (Hummel & Schlick, 2016.)

Prior research can be found to support this notion. For example, Clarckson et al. (2013), De Villiers and Marques (2016) and Plumlee et al. (2015) explore this issue in various settings; their findings support the notions of the voluntary disclosure theory. Thus, in the context of deductive studies scholars can assume, with reasonable certainty, that high-quality disclosures accurately reflect the true sustainability performance of examined organizations.

2.2 The voluntary nature of sustainability reporting

Environmental reporting, or sustainability reporting is defined by Gray (2005) as the preparation, presentation and communication of information relating to an organization's interactions with the natural environment. Although several extra governmental bodies, such as the UN, have issued sets of recommendations concerning sustainability reporting and the inclusion of environmental reports in financial statements, it is difficult to commend international organizations on their efforts (Gallego, 2006). Due to a lack of a unified supervision on the part of

governments and extra governmental agencies, sustainability reporting most often refers to voluntary reporting and the self-regulation of corporations. As environmental footprints tend to increase with company size, sustainability reporting is mainly associated with large corporations. Sustainability reporting is the most important platform for informing stakeholders about corporate environmental performance. Nowadays, most companies include these reports within financial statements, while others issue standalone environmental reports, or in fact both. (Gray, 2005.)

A notable characteristic of sustainability reporting is the lack of consistency when it comes to the level of reporting between different geographical areas. In most countries, reporting is a voluntary practice, while countries such as Australia, Japan and the UK mandate the provision and contents of sustainability reports to a certain degree (Dagiliene, 2010). As can be assumed, the most persistent problem with voluntary reporting is the willingness or unwillingness to disclose certain pieces of information. Therefore, the level of adherence to sustainability reporting regulation often comes down to the societal factors. Specifically, the level of enforcement plays a vital role in forcing and incentivizing corporations to adhere to suggestions and regulations (La Porta et al., 1998; Ioannou & Serafeim, 2011). The differences in levels of enforcement explain a major portion of variation between economic zones across the globe in terms of reporting quality (Fernandez-Feijoo, Romero & Ruiz-Blanco, 2014). Naturally, though, the argument is never one-sided: great leaps have also been taken in reporting quality at least partly due to legislative pressure. Gallego (2006) finds that especially during the early nineties both compulsory reporting and voluntary reporting quantity and quality rose globally, and that the number of firms disclosing environmental expenses, investments and provisions for environmental liabilities grew.

High-quality environmental reporting is becoming more and more incentivized; ethical investing, environmental activists and tightening legislation all force companies to strive to report at higher levels. Reports commonly include information on the operations and policies of the company, its management practices regarding environmental issues as well as environmental data on subjects such as pollution, greenhouse gasses and land use. Gray (2005) finds that most reports tend to focus on per unit efficiency when it comes to ecological issues. While these types of reports certainly offer scholars valuable – comparable – information, it shrouds investors from

the harsh reality: more often than not, a company's total environmental footprint is increasing, even if per-unit efficiency increases. (Gray, 2005.)

Prior research indicates that a counter argument for the incentivization of voluntary sustainability reporting also exists. Retail investors – who typically face higher levels of information asymmetry than institutional investors – may not be able to reliably assess the credibility of CSR disclosures. Furthermore, fraudulent disclosures may prove problematic due to *greenwashing*. Therefore, rather than providing an improved information environment, CSR reporting may offer noisy signals to retail investors. (Nair, Muttakin, Somanath & Subramaniam, 2019.)

2.3 GRI

To combat the rather difficult and branched nature of sustainability reporting, several voluntary reporting frameworks have been introduced, perhaps the most commonly used of which is the Global Reporting Initiative (GRI) (Raucci & Tarquino, 2015). While criticized, the GRI arguably trumps other models by assisting companies in creating balanced and reliable reports on their economic, social and environmental performance (Raucci & Tarquino, 2015). GRI indicators are, in fact, often considered to be the most credible sources for analyzing CSR performance and can be considered to be the *de facto* standard for sustainability reporting today (Tarquino et al., 2018). Due to its wide recognition and high relevance, GRI is used as the basis for analyzing both reporting quantity and reporting quality in this thesis.

The GRI was launched in 1997, initiated by the United Nations Environmental program and the Coalition for Environmentally Responsible Economies (CERES) to be a "*long-term, multi-stakeholder, international process whose mission is to develop and disseminate globally applicable sustainability reporting guidelines*" (Gallego, 2006, 82.). Various updates to the original framework (G1) have ultimately led into enriched indicators of sustainability and far simpler implementation for the latest iteration, GRI G4 (2014). At its core, GRI is used as a set of guidelines for companies to ensure that sustainability reporting standards remain at a satisfactory level. The latest incarnation of the framework consists of a general introductory section,

foundations, which is followed by three topic-specific sections on economic, environmental and social performance, each divided into applicable sub-sections[4].

Each GRI section and sub-section consists of *performance indicators*. Performance indicators are, in essence, markers which indicate the level of compliance with high-level sustainability reporting standards. Performance indicators are utilized bilaterally; on the other hand, they are essential for concisely describing and informing stakeholders about the complex events and actions which amount to an organizations' sustainability performance, but on the other, they are effective as management control tools, guiding organizations to more favorable outcomes. They assist companies in finding areas of inefficiency, whilst also communicating an organizations' commitment towards sustainability to stakeholders. Above all, though, GRI performance indicators offer invaluable, comparable data on the sustainability performance of companies. (Raucci & Tarquino, 2015; Gallego, 2006.)

As this thesis focuses specifically on environmental issues, the main area of interest is GRI 3. Table 1 outlines the performance indicators of sub-sections GRI 301-308:

GRI 301, Materials	301-1 301-2 301-3	Materials used Recycled input materials Reclaimed products/packaging
GRI 302, Energy	302-1 302-2 302-3 302-4 302-5	Energy consumption (EC) EC outside organization Energy intensity Reductions in EC Reductions in energy requirements of products and services
GRI 303, Water & effluents	303-1 303-2 303-3 303-4 303-5	Interactions with water Management of discharge Water withdrawal Water discharge Water consumption
GRI 304, Biodiversity	304-1 304-2 304-3 304-4	Operations adjacent to protected areas Impacts on biodiversity Habitats protected/restored Nature conservation & red list species[5]

[4] For an outline of GRI, see appendix 1.
[5] Comprehensive list of the conservation status of plant and animal species upheld by the International Union for Conservation of Nature.

GRI 305, Emissions	305-1	Scope 1[6] greenhouse gas (GHG) emissions
	305-2	Scope 2 GHG emissions
	305-3	Scope 3 GHG emissions
	305-4	Emissions intensity[7]
	305-5	Reductions in GHG emissions
	305-6	Ozone-depleting substances
	305-7	Other greenhouse gasses
GRI 306, Effluents & waste	306-1	Water discharge by quality
	306-2	Waste type & disposal
	306-3	Significant spills
	306-4	Hazardous waste
	306-5	Water bodies affected
GRI 307, Compliance	307-1	Non-compliance with environmental law, i.e., fines & sanctions
GRI 308, Supplier screening	308-1	Suppliers screened

Table 1, GRI 3 sub-sections and description of performance indicators

As is evident, GRI compliance demands a range of highly revealing metrics to be disclosed by companies. What is evident, though, is the emphasis on effluents, energy and emissions. However, this might not directly reflect the relative importance of said sub-sections, but rather the relative complexity of measuring different sustainability-related metrics.

2.4 The evolution of studies revolving around sustainability reporting

Early research on sustainability reporting mainly focuses on determining whether differences in reporting reflect a difference in environmental performance. The focus seems to have been on issuing highly generalizable conclusions, such as Hughes et al. (2001), who find that during the 1990's, companies with lower sustainability performance report at higher levels than those with superior performance. Other generalizations are provided by, for example, Crowther (2002), who reports several benefits for environmental reporting, such as increased sales through a more sustainable image and easier recruitment of labor. During the time, a major line of research focused on the perceived benefits of both CSR performance and reporting. Studies of the time indicate that CSR can be effectively used as a tool for corporate

[6] Scope 1 refers to direct GHG emissions; scope 2 to energy indirect emissions and scope 3 to other indirect emissions.
[7] Emissions intensity refers to the level of GHG emissions per unit of economic activity.

governance and resource management (Figge et al., 2002; Hahn & Scheermesser, 2006; Labuschange et al., 2005). CSR benefits were found to be both internal and external (Schaltegger & Wagner, 2006) and CSR was often seen as the antidote for the complexity of a globalized marketplace in terms of optimizing environmental resources (Dyllick & Hockerts, 2002). As for external benefits, CSR reporting was found to be beneficial for the market at large due to enhanced information quality and quantity (Azapagic, 2004).

Many papers have focused on studying one of the three performance indicators in GRI: social, environmental or economic (Ilinitch et al., 1998; Jasch, 2000; Olsthoorn et al., 2001; Gallego-Àlvarez, 2012), and it is safe to consider such research rather diverse, if not somewhat conclusive. Prior research has taken a variety of approaches when it comes to the analysis of single performance indicators: economics, management accounting, ecology and other physical forms of research approaches have yielded significant results (Olsthoorn et al. 2001). What has to be noted, though, is that earlier research seems to mostly analyze these performance indicators separately, not as parts of GRI, the *de facto* voluntary reporting framework of the 21st century. Prior research has also tackled the task of analyzing the three performance indicators jointly (see e.g. Morhardt et al., 2002; Guthrie & Farneti, 2008; Skouloudis & Evangelinos, 2009; Skouloudis et al., 2010). These studies typically analyze the indicators as a part of broader research, which cover the entirety CSR reports along with the quality and compliance to GRI guidelines or other environmental standards (Tarquino & Raucci, 2015). Some research has also extended to specifically studying the use of GRI indicators within the CSR reports of organizations, although it seems challenging to summarize the general research goals of such studies concisely (Gallego, 2006; Roca & Searcy, 2012; Samuel et al., 2013; Alazzani & Wan-Hussin, 2013).

2.4.1 Country-specific research on sustainability indicators

Gallego (2006) seems to be one of the first papers to take a country-specific outlook into GRI indicators research. The scholar analyzes the disclosure of GRI indicators in the sustainability reports of Spanish companies, which indicates that the largest shortcomings of these companies lie in social performance, specifically labor practices. Light is also shed onto environmental factors such as water and energy.

Gallego concludes by stating that sector affiliation affects the number of disclosed indicators. (Gallego, 2006.)

Roca and Searcy (2012) analyze the use of indicators in corporate sustainability reports via content analysis of Canadian companies. All in all, over 500 indicators were identified, along with confirming the use of GRI guidelines as a baseline for reporting for a significant number of companies. The main findings indicate that industry affiliation affected both CSR reporting in general, as well as the use of GRI. GRI indicators were used well in sensitive industries such as oil and gas, construction and mining, whereas lackluster implementation was found in industries such as electricity, retail and food. (Raucci & Tarquino, 2018.)

Along with cross-sectoral analyses, some research takes on a tighter scope, limiting the study to a given industry as well as a geographically bound area. Samuel et al. (2013), for example, study the petrochemical industry in Malaysia with regard to the sustainability indicators used. Results indicate that the utilized performance indicators were lacking in terms of ecological carrying capacity, and that petrochemical companies focus on compliance, performance and environmental impacts when it comes to CSR reporting.

Fully international studies seem to be few and rather far apart when it comes to CSR reporting analyses. It can be speculated, that the cultural differences between different economic areas make these analyses low value at best and offer little comparable results. Despite the assumed shortcomings, this line of research has had its fair share of mentionable works. What is notable, however, is that a majority of country-to-country comparisons place heightened emphasis on the cultural differences between countries, for example by utilizing Hofstede's model dimensions the results of which are not directly applicable for this thesis.

Finally, international comparative studies have been carried out during the past years in both Central and Eastern Europe (for exhaustive overview of such studies, see Petera, Wagner, Paksiova and Krehnacova, 2019, p. 484). Differences between industries have been noted but generalizing the results of such studies has nevertheless

proven challenging due to varying methods and a variety of different forms of analyzable disclosures.

2.5 Indicators and determinants of sustainability reporting performance

The relationship between several determinants and sustainability reporting is all but abundant. However, one cannot help but to come to the conclusion that empirical findings remain divided as to the effect of many of these determinants. Certain drivers no doubt exist, but a plethora of variables affect the obtained results, and it would therefore be foolish to characterize such research evidence as exhaustive.

Raucci and Tarquino (2018) note that research on sustainability indicators can be roughly divided into three sections: studies which investigate a certain type of indicators disclosed within CSR reports (see e.g. Boiral & Henri, 2016; Sagiv, Schwartz, 2007; Asif et al., 2012), studies investigating the full spectrum of disclosed GRI indicators (see e.g. Gurthie & Farnetti, 2008; Skouloudis et al., 2010) and studies only exploring those indicators which are disclosed in sustainability reports (e.g. Raucci & Tarquino, 2015).

Prior research has provided numerous results which shed light on the positive effects of GRI reporting. Firm value (Lo & Sheu, 2007; Schadewitz & Niskala, 2010) and performance (Ameer & Othman, 2012) is increased through the mitigation of information asymmetries between companies and their stakeholders. Improved image, community relations and increased social legitimacy can be achieved through sustainability reporting (Kiliç & Uyar, 2014; Kiliç et al., 2015) and there is an argument to be made, that disclosing sustainability-related information results into more effective valuations due to increased transparency and accountability (Nobanee & Ellili, 2016). However, many findings also indicate that there are significant relationships to be found between company-level determinants and GRI sustainability performance.

Concerning environmental reporting performance, one of the most influential determinants – as per extant literature – is *industry affiliation*. Industry affiliation is most often explored as per the suggestions of the legitimacy theory (Braam et al.,

2016). Studies (Brammer & Pavelin, 2008; Reverte, 2009; Kansal et al., 2014; Shamil et al., 2014) have yielded notable results, indicating that the industry in which a company operates in greatly effects the way in which they disclose sustainability-related matters. Specifically, GRI reporting performance and variety seem to also change greatly by sector (Raucci & Tarquino, 2018). Industry affiliation has also been discussed specifically related to GRI adoption, where mainly positive associations have been found (Branco et al., 2014; Legendre & Coderre, 2012).

Findings note that mining, oil, gas and the electricity sector all disclose a more – and utilize a higher variety of GRI performance indicators – on their sustainability reports (Perrini et al., 2007; Lattemann et al., 2009; Broberg et al., 2009; Monteiro and Aibar-Guzmán, 2009). In terms of the sheer quantity and breadth of reporting, Raucci and Tarquino (2018) note both return on equity and industry affiliation as important determinants. (Raucci & Tarquino, 2018.) Specifically, it seems that the reports of companies considered to operate in *sensitive* sectors differ greatly from those which do not (Simnett, Vanstraelen & Chua, 2009). Similarly, research indicates that affiliation to a *high-profile* industry affects the quality and quantity of sustainability reporting (Petera et al., 2019). Differing findings are presented by, for example, Nazari et al. (2015), although such evidence seems scarce. Findings on industry affiliation are partly explained by Bouten et al. (2011): reporting is often seen, by companies in sensitive sectors, as a mechanism that they can utilize to be discharged from social and environmental responsibility.

Nationality has been found to be important in explaining the quality and quantity of sustainability reporting among organizations (Raucci & Tarquino, 2018). Cultural characteristics have been found to affect the behavior of individuals under given social, cultural and legal systems by influencing the ways that CSR is approached and utilized, and this naturally may have its effects on sustainability reporting performance (Fernandez-Feijoo et al., 2014). Additionally, nationality seems to affect the decision to obtain third-party assurance for sustainability reports (Raucci & Tarquino, 2018).

Company size is a widely accepted driver of sustainability reporting. Several studies (Skouloudis et al., 2014; Kansal et al., 2014; Shamil et al., 2014; Nazari et al., 2015) have explored its effects from different viewpoints, basing their theoretical foundation

mainly on the legitimacy theory (Kuzey & Uyar, 2017). Perhaps the most exhaustively studied, size has been shown to have a positive relationship with sustainability reporting performance (see e.g. Patten, 1991; Clarkson, Overell & Chapple, 2011; Reverte, 2009; Liu & Anbumozhi, 2009; Lourenço & Branco, 2013; Kansal et al. 2014; Bhatia & Tuli 2017; Karaman et al., 2018). Conversely, other studies (Dilling, 2010; Lungu et al., 2011) found no relationship between size and sustainability reporting.

The effects of size as a determinant have been relatively widely explored both across sectors, and within industries; see e.g., Font, Walmsley, Cogotti, Macombes and Hausler (2012), who show that there is a disclosure performance gap between small and large companies in the hospitality industry. Along with strong empirical support for a positive relationship between size and sustainability reporting quality and quantity, a strong line of theoretical support also exists as to the perceived effects of size: both the legitimacy theory (Suchman, 1995) and the stakeholder theory (Eisenhardt, 1989; Jensen & Meckling, 1976) predict that sustainability reporting quality and quantity are enhanced by increased company size (Karaman, Kiliç & Uyar, 2018). A partial explanation for this phenomenon can be found from Petera et al. (2019), who suggest that the annual disclosures of large corporations are comparatively more standardized by structure, which increases the total amount of disclosure, which itself is subsequently assumed to also increase the amount of sustainability reporting.

Conversely, some research also indicates that the effects of high sustainability reporting change by industry affiliation: Yip et al. (2011) find that CSR disclosures have a positive relationship with earnings management within the food industry and a negative relationship within the oil and gas industry. The scholars conclude that the relationship between CSR and economic performance is often highly reliant on context and that the effect of political environment is relatively more important than ethical considerations (Yip et al. 2011).

Another identified determinant is economic performance, although results seem to be divided as to the effect it may have on sustainability reporting performance (see e.g., Stanny & Ely, 2008; Roberts, 1992; Hackston & Milne, 1996). In terms of economic

performance indicators, prior research points out that the explanatory characteristics of profitability are noteworthy (Petera et al., 2019). However, empirical findings present highly varying suggestions as to the direction and significance of the relationship. Studies by Waddock and Graves, as early as 1997 and many others (Liu & Anbumozhi, 2009; Atriach et al., 2010; Lourenço & Branco, 2013; Kansal et al., 2014;) report a positive relationship between profitability and sustainability reporting. However, studies Reverte (2009) and others (Shamil et al., 2014; Andrikopoulos et al., 2014; Karaman et al., 2018) fail to find statistically significant effects, and Jennifer Ho and Taylor (2007) find a negative relationship between the two variables.

Profitability seems to affect sustainability disclosures on the basis of legitimacy and ensuring access to scares resources. To mitigate the illegitimacy of their existence and profits, highly profitable companies use acquired resources and capital to report at superior quality. They are also expected to report more than less profitable companies (Branco and Rodrigues, 2008; Gamerschlag, Moller, & Verbeeten, 2011). As with many economic determinants, the effects of profitability on sustainability reporting performance are contested (Reverte, 2009). A significant line of research focuses on exploring the effects that CSR disclosures have on economic performance. Much of said research is built on the premise that companies are able to better communicate their economic performance when financial transparency is increased. It is assumed that sustainability-related transparency is increased once financial transparency is emphasized in an organization.

Earnings analysis is in the epicenter of much of economic performance analysis, and is rather conclusively studied (Nair et al., 2019). Kim et al. (2012) explore the relationship between CSR and earnings and find that US companies practicing high-level CSR are less inclined to engage in earnings management. Specifically, the scholars indicate that such companies are less likely to engage in aggressive earnings management and are less likely to be subject to investigations by the Securities and Exchange Commission. Socially responsible firms have been found to present higher-quality accruals and both more persistent and predictable earnings (Hong & Andersen, 2011; Laksmana & Yang, 2009). However, findings which suggest otherwise also exist, for example, in Salewski and Zülch (2013), who find that firms with high level

CSR are more likely to engage in earnings management and report unfavorable information with decreased proclivity.

Growth is a variable which seems to have evaded much of the focus in terms of research on its effect on sustainability reporting. Studies (Atriach et al., 2010; Ameer & Othman, 2012; Shamil et al., 2014) report of a positive relationship between the two variables, and several others (e.g., Lourenço & Branco, 2013) support the notion, despite failing to provide significant statistical evidence. However, later studies, such as Kusey and Uyar (2017) find no relationship between growth and sustainability reporting.

Leverage is somewhat similar as the mentioned drivers of sustainability in that its effects remain largely unclear. Some studies (e.g., Drobetz et al., 2014; Bhatia & Tuli, 2017; Kuzey & Uyar, 2017) find that leverage has a negative effect on sustainability reporting, while others (Martínez-Ferrero et al., 2015; Nazari et al. 2015; Hussain et al., 2016) fail to find indications of a significant effect.

As far as the extent of this literature review, it seems that there is little research on the effects of *ownership structure* and *board composition* – as per the definitions of these outlined in upcoming chapters.

3 THEORETICAL FRAMEWORK

The following section of the thesis contains a review of the applicable theoretical models regarding sustainability reporting and its company-specific determinants. Due to the complex nature of effects the chosen determinants have on the quality and quantity of sustainability reporting among sample companies, multiple theoretical frameworks require attention. Of the theories related to sustainability reporting – as per extant literature – the most important ones seem to be the agency, legitimacy, stakeholder and signaling theories (Reverte, 2009; Amran & Haniffa, 2011; Hahn & Kuhnen, 2013). These theories, however, arguably involve several overlapping sections, and for the sake of simplicity – in addition to the wide explanative properties of each respective theory in themselves – this thesis focuses on the Stakeholder theory and the Legitimacy theory.

There are two endowing viewpoints to sustainability reporting at a general theoretical level. Hasseldine, Massoud and Toms (2007, 1.) describe the first as *benign managerialism*, in which corporations are viewed as "*enlightened oligarchies*", in which the senior management acknowledges the responsibilities they have for the society at large and implement procedures which support these beliefs. As such, this is a rather positive viewpoint on the concept as a whole, as it stems from the philanthropism of management. What this line of thought implies, though, is that the rate at which companies disclose sustainability-related issues is proportionate to the scope and level of a companies' activities, which is often not the case. The other viewpoint presented by the scholars is a market-driven approach[8], where it is assumed that managers fail to act according to an ethical code, and that by engaging in sustainability reporting, managers are purely reacting to the demands of stakeholders. Adopting this viewpoint, it should be hypothesized, that the levels of sustainability reporting will vary by societal pressure. As will be shown in previous sections, on the basis of extant business theory, this thesis finds the latter of these viewpoints more compelling. (Massoud et al. 2007.)

[8]Also referred to as the *Maginot* hypothesis (Glasbeek, 1988).

What follows, is a condensed account of the Stakeholder theory, Legitimacy theory, and Institutional Isomorphism. Each section concludes with some analytical remarks on the applicability of the theory in question in sustainability reporting. Thereafter, the subsequent sub-chapters outline the theoretical backing for the effects given determinants are expected to have on the quality and quantity of sustainability reporting, along with presenting the hypotheses for each determinant.

3.1 Stakeholder Theory

Among the theories concerning corporate sustainability, the stakeholder theory (ST) is perhaps considered as one with the most explanatory value regarding sustainability-related corporate practices (Spence et al. 2010). Many accredit the model to E. Freeman's 1984 book, *Strategic Management: a stakeholder approach*, and it is often characterized as a "foundational perspective" into corporate strategy. Initially, ST was created as a strategic tool, rather than a theoretical model and Freeman himself described the purpose of ST as barely enriching the act of strategic management. (Elms, Johnson-carter & Berman, 2011.)

The Stewart, Allen & Cavender (1963) are among the first to define stakeholders in stating that they are groups without whose support an organization would cease to exist. The stakeholder theory, in essence, revolves around the notion that companies should maintain good relations with *all* of its stakeholders, rather than focusing solely on creating additional value (Reverte, 2009). Elms et al. (2011) find that the key purpose of stakeholder relationship management is to ensure that managers have sufficient understanding of the expectations the operative environment places on the company. They argue, that without this, managers are unable to formulate strategies which provide competitive advantages for the company. Freeman (1984), on the other hand posits that while corporate sustainability, social responsibility and a company's central business activities are inherently independent functions, they should be considered as conceptually inseparable. Later research (e.g., Laplume et al., 2008) supports the notion that the fundamental premise of the model is to consider a wide array of external influences, rather than a limited group of individuals and institutions which hold an interest in the company. Furthermore, scholars such as Marshall et al. (2010) argue that the recent trend in increased focus on sustainability issues can, in

fact, be seen as a *paradigm shift*, whereby the existence of companies involves a mandate regarding sustainability.

Stakeholder theory can be further divided into various sub-categories, two of which are central to this paper. *Business-centric* stakeholder theory suggests that stakeholder management is done primarily for the service of the company, rather than its stakeholders. Freeman's (1984) intention for the model is for it to be a guide for directing the firm onto the right path, and so, business-centric understanding of stakeholder management is generally in line with the fundamental intentions of the theory. Scholars such as Donaldson and Preston (1995) agree with this notion in stating that the aim of stakeholder management has to revolve around improving the ways a business creates value. Therefore, if a company is to have positive effects on the environment – both societal and ecological – it operates in, it does this indirectly, through improving its approach to strategic management (Elms et al. 2011).

In sharp contrast, *normative* stakeholder theory explains the effects that corporations have on their operational environments through moral and ethical boundaries. Specifically, this school of thought argues that companies are directed by the ethical and moral codes of their stakeholders, and that therefore, the decisions made by companies are fundamentally based on morality. Normative stakeholder theory also contains the notion of fairness regarding the reciprocal relationship between a company and its stakeholders: firms are obliged to treat participants – i.e., stakeholders, which usually provide benefits for the company, and who the company provides benefits to – fairly and with appropriate support. (Elms et al. 2011.) It can be argued that normative stakeholder theory is, in many ways, similar to the institutional theory. Both theories emphasize the rules, regulations, ideas and cultural settings in which firms operate (Raucci et al., 2018), in that they assume that the actions of companies are strongly influenced by the societal expectations that stakeholders have for the company. For the sake of simplicity, and in order to limit overlapping effects, this thesis focuses on normative stakeholder theory rather than institutional theory. Further, extant literature seems to highlight the importance of the former in explaining the actions of corporations regarding sustainability reporting to a significantly higher degree than the latter.

3.2 Legitimacy theory

Legitimacy theory is a somewhat more intricate line of theory in comparison to the stakeholder theory. Built upon the concept of organizational legitimacy, the theory posits that companies are to strive for a certain position, or status. Dowling and Pfeffer (1975, 122.) define organizational legitimacy as follows:

"[organizational legitimacy is] … a condition or status which exists when an entity's value system is congruent with the value system of the larger social system of which the entity is a part. When a disparity, actual or potential, exists between the two value systems, there is a threat to the entity's legitimacy".

Following on the lines of Dowling and Pfeffer, the legitimacy theory suggests that companies should be unceasing in their goal to ensure that they operate within the premises set by their stakeholders and the society at large (Gurthie, Cuganesan & Ward, 2007). These premises outline the legitimate operations of a company. The theory assumes that no company has an innate right to exist (Dowling & Pfeffer, 1975) and that in order to exist, a company must achieve a certain level of understanding and reciprocity with the society it operates in. Hence, companies form social contracts between themselves and the society in which they act in (Deegan, Rankin & Tobin, 2002); naturally these are, more often than not, barely implied or expected, rather than formally agreed upon. These contracts generally imply that the survival and growth of a company are reliant on A) delivering socially desirable outcomes to society in general and B) and sharing the obtained economic benefits with the stakeholders from which it derives its power. (Shocker & Sethi, 1973, 67.) This operational necessity arises from the assumption that society provides companies their resources and that without them, it is impossible to conduct successful business activities (Deegan et al., 2002).

Central to understanding the practical implications of the theory, is the concept of *legitimacy gaps*, as referred to Lindblom (1994). This is characterized as the perceived difference between the expectations the public has on a company in terms of actions, and how the company acts in reality (Lindblom, 1994). Companies can engage in various activities in order to regain certain levels of legitimacy. On a conceptual level,

these can arguably be divided into two, sometimes contradictory paths: either altering the underlying action which has created the legitimacy gap or mitigating the effects of the illegitimating action. In the context of this thesis, one might consider enhancing sustainability-related practices as an example of the former, and changing reporting practices, content or emphasis – or greenwashing[9] – as an example of the latter. While the moral justification for these paths is hardly equal, both may prove effective in managing legitimacy gaps. In the end, though, it seems more likely that companies will place more emphasis on mitigating the effects of illegitimating operations – for example, through sustainability disclosures – as it is often easier to manage the image of actions than to make concrete changes to actions themselves (Dowling & Pfeffer, 1975; Lyon & Maxwell, 2011; Neu, Warsame, & Pedwell, 1998). Previous literature shows that companies do indeed increase the quantity of sustainability disclosure in order to respond to social expectations and various stakeholder pressures (Al-Tuwaijri, Christensen, & Hughes, 2004; Branco & Rodrigues, 2008; Clarkson, Li, Richardson, & Vasvari, 2008; Cormier, Gordon, & Magnan, 2004).

The legitimacy theory paints a bleak picture of the usefulness of sustainability reporting. Following on the lines of Deegan et al. (2002), one is easily persuaded to view sustainability disclosures as nothing more than tools that companies use in order to make their operations appear to abide with societal expectations; regardless of whether they actually do. Here we can see overlap between the Stakeholder theory, as CSR disclosures can, in fact, be seen as functions of stakeholder pressure (Patten, 2002). As such, therefore, it is not a surprise that extant literature points to a negative relationship between sustainability disclosure and actual sustainability performance. Poor performers have been found to consistently disclose environmental information at higher rates than their counterparts. Thus, sustainability reports should arguably not be viewed as high environmental performers portraying their achievements in the field, but rather, as poor environmental performers attempting to minimize the legitimacy gaps that result from their poor environmental performance (Cho & Patten, 2007).

[9] Greenwashing: An attempt to make your business seem interested in protecting the natural environment, when it is not. (Cambridge Dictionary, 2020)

This view is supported by, for instance, Cowan and Deegan (2010), who find that Australian firms use carbon emission disclosures as reactive measures to mitigate the legitimacy gaps between governmental expectations and actual performance. As it seems that environmental disclosures are far more likely to solely represent reporting quality – as opposed to actual environmental performance – and such disclosures appear effective in minimizing the legitimacy gaps created by poor performance, it seems that the incentives for real change are low. Milne, Kearns & Walton (2006) specify examples of unfaithful sustainability disclosure in suggesting that companies, which portray sustainability as a *journey*, in their disclosures, are often attempting to obscure investors from the true nature of their environmental performance.

Therefore, it has to be concluded that the expected effects of determinants on sustainability reporting will hardly indicate positive relationships with environmental performance itself. However, the strong need for environmental legitimacy for many types of companies provides scholars with strong signals as to what can be expected from determinants such as company size, board composition and ownership structure.

3.3 Institutional theory and isomorphism

Institutional theory and isomorphism arguably walk hand in hand, and indeed, they are perhaps the most intriguing theoretical viewpoints considered in this thesis. Bordering psychological theory, modern institutional theory saw daylight in 1977 via Meyer and Rowan's pivotal piece. The cited works are rather dated, but interestingly, it seems that the suggestions of the theory are now, more than ever, applicable. For the sake of understanding the affects the theory has on sustainability reporting, it is worth taking a deeper look into the very foundations of the school of thought.

3.3.1 Institutional theory

> *Many formal organizational structures arise as reflections of rationalized institutional rules. The elaboration of such rules in modern states and societies accounts in part for the expansion and increased complexity of formal organizational structures. Institutional rules function as myths which organizations*

incorporate, gaining legitimacy, resources, stability, and enhanced survival prospects (Meyer & Rowan, 1977: 340)

Meyer and Rowan argue that organizational structures are shaped by – and reflect – the rationalized institutional rules of the societies corporations operate in. In any given society, certain concepts and ways of action emerge as the *best practice*. The scholars argue that the social expectations, which are in themselves based on generally prevailing best practices, force companies to adopt the procedures which are seen by the society as appropriate to companies of certain posture. The adoption of these procedures is seen as the most important factor in achieving societal legitimacy. (Meyer & Rowan, 1977.)

What differentiated the institutional theory from previous scholarly works is the fact that it considers that legitimacy as imperfect, rather than absolute. That is, works before Meyer & Rowan's operated with perfect markets, where it is assumed that corporations do not have to strive for legitimacy within the environment they partake in (Meyer & Rowan, 1977), and companies can therefore make decisions based solely on a business rationale (Rüdiger & Hahn, 2013). These works assumed that the basis for decision making in corporate environments can be found solely in controlling and coordinating activities. However, Meyer & Rowan argue that while a major portion of decisions are indeed based on coordination, organizations that adopt universally accepted practices are able to increase their legitimacy and therefore, chances of survival – regardless of the decisions they make in terms of coordination. The scholars describe the phenomenon of making decisions partly based on environmental expectations rather than business rationale as *institutionalization*. (Meyer & Rowan, 1977.)

What has to be noted though, that gaining legitimacy through institutionalization should not be considered as an ostensible action. On the contrary, formal structures are important creations of the society in question; these structures represent the deepest roots of relational networks and social understanding. Fundamentally, they reflect the social reality, and therefore, abiding with the suggestions posed by these structures may well prove valuable for an organization. (Meyer & Rowan, 1977)

3.3.2 Institutional isomorphism

Institutional isomorphism builds on the institutional theory in that it suggests that organizations become increasingly homogenous. Increased bureaucracy has been considered as the main form of homogenization for organizations attempting to gain legitimacy within societies. Dimaggio and Powell (1983) agree with Meyer & Rowan in that organizational change does not necessarily occur for the sake of efficiency or business goals and that many instances of homogenization are driven by other factors than increased competition. They argue that while companies make decisions which are motivated by a multitude of factors, they are fundamentally bound by the environment they operate in:

> *... in the long run, organizational actors making rational decisions construct around themselves an environment that constrains their ability to change further in later years. (Dimaggio & Powell, 1983)*

This homogenization is described as institutional isomorphism. Isomorphism is perhaps best defined by Hawley (1968):

> *Isomorphism is a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions.*

In the context of organizational institutionalization, it is suggested that the characteristics of an organization are constantly modified and become increasingly compliant with the implications posed by the operational environment. (Dimaggio & Powell, 1983.)

Isomorphism is not only a conscious and systematic decision, but a process that occurs organically. As organizations compete, they will inevitably also compete for legitimacy, social performance and political power alongside competing business-wise. One might, therefore, consider isomorphism as *natural selection* among companies: isomorphism may occur as nonoptimal forms of operation are neglected

among a certain population of companies, because managers learn and adopt appropriate responses whilst adjusting their behavior to fit the requirements of the environment (Freeman, 1982). Dimaggio and Powell (1983) identify three forms – or avenues – that describe the formation of the effects of institutional isomorphism, the first of which is *coercive isomorphism.*

Coercive isomorphism is a force or act of persuasion that companies feel to steer towards the expectations of society. Formal and informal pressures are exerted on companies by both other organizations and other actors. Informal pressures rise from the interdependency of organizations and other actors in operational environments; for example, companies may be forced into certain moral codes as a result of the sociocultural expectations. Along with informal pressures, coercive isomorphism may be the direct result of regulation. In fact, common legal environments, contributing to the behavior and structure of organizations, are considered as one of the main ways that coercive isomorphism portrays itself. All in all, in developed societies where expectations have come to shape the organizational scene, it is seen that company structures become more homogenous as they reflect what is considered legitimate – i.e., *fitting for an institution, an entity which is institutionalized* – according to society to a higher rate. (Dimaggio & Powell, 1983.)

Mimetic Isomorphism, at its core, is copying the practices and structures of other companies. Companies act in states of existence which are often inherently uncertain in a number of ways. Uncertainty may arise from a multitude of factors, for example, from technology, ambiguous goals, or environmental factors. It may be felt by organizations that adopting the practices of other – perceivably more successful, more established or more legitimate – organizations might help in mitigating uncertainty. One reason for the existence of mimetic isomorphism is cost: it is often not economically viable to search for new practices, when ways of action, that have been proven business-wise, are available. Where adopting ready-made, proven solutions provides a somewhat guaranteed aid to a given situation, developing proprietary solutions involves varying levels of uncertainty in and of itself: the solution may fail to meet the quality or standards of alternative ways of action. (Dimaggio & Powell, 1983.)

At a general level, due to increased external pressure, mimetic isomorphism increases with the size of an organization. A wide customer base or a highly skilled labor force may increase the pressure on an organization to offer programs and services that others do. In this sense, mimetic isomorphism is not limited only to lower quality firms copying high-quality organizations; mimetic actions can be taken on purely on the basis that another company does something specific in a more beneficial, efficient or legitimate way. (Dimaggio & Powell, 1983.) Despite a general need for organizations to differentiate themselves from others, populations of companies tend to become increasingly homogenous due to the fact that plainly, there is relatively little variation and diversity to choose from, when it comes to business activities. Organizations are and will inevitably continue to be modeled on existing entities, and managers are inclined to actively search for models to build upon, which have already been proven. (Kimberly, 1980.)

Normative isomorphic pressures stem from *professionalization*. Dimaggio and Powell (1983, 152) describe professionalization as:

> *... the collective struggle of members of an occupation to define the conditions and methods of their work to control the production of procedures and to establish a cognitive base and legitimation for their occupational autonomy.*

Normative isomorphism is a mostly indirect avenue of homogenization. Professionals are affected by the same coercive and mimetic pressures as organizations. Hence, normative isomorphism occurs through the effects of coercive and mimetic isomorphism on professionals within organizations, who act as the intermediaries between coercive-mimetic isomorphism and normative isomorphism. There are many aspects of professional life that encourage normative isomorphism, three of which arguably rise above others in importance. The first of these is *formal education*. As the essence of professional legitimacy lies in professional education, the universities which educate professionals act as hubs of homogenization, in which certain norms for professionals are set. Second, *professional networking*. Once professional networks span across organizations – which they often do, due to formal education – homogenization is increased due to faster information dispersion. at an increasing rate

Finally, filtering of personnel. Professionals are often hired within the same industry; they are often educated by a narrow group of institutions and skill-level requirements often drive hiring managers to a certain group of individuals. All of these factors contribute to the normative isomorphism of organizations; and Dimaggio and Powell (1983) even argue that due to the close-guarded nature of the professional groups engaging in business, individuals who reach the highest levels of organizational hierarchy, are virtually undistinguishable – barring minor intricacies. The implication of all factors of normative isomorphism is that the professionalization of management tends to walk hand in hand with the *institutionalization* of organizational fields. (Dimaggio & Powell, 1983.)

3.4 Theoretical points of focus

While the covered theoretical models affect this study, all in their own right, it will be shown that institutional isomorphism – in its various avenues – is one that proves most valuable for this thesis. The value of the theory arises from the fact that, when compared to other models mentioned in this section, it offers relatively more inclusive suggestions. That is not to belittle the accuracy of the proposed effects and suggestions of the model; contrarily, it provides invaluable information on how company-specific variables affect sustainability reporting among Finnish companies at higher levels.

4 RESEARCH DESIGN

4.1 Determinant relationships and hypothesis formation

While forming hypotheses for determinants, it is invaluable to understand that many of the predicted effects are the result of the process of homogenization of company operations. Therefore, in addition to the traditional business theories mentioned in this section, *institutional isomorphism* is bound to play a notable role in determining the direction and significance of the observed effects. Therefore, it is necessary to understand that the depth, quality and preparation of sustainability reports are not necessarily based on the logic of the business, but are reactive measures responding to external influences (Raucci et al., 2018).

In other words, increased sustainability reporting – in general – has been argued to be a product of strong institutional influences, which result into increased reporting quality and quantity, both out of will and necessity. Raucci et al. (2018) suggest a four-headed approach to understanding the perceived and hypothesized results: effects are determined by A) the business itself, B) compliance with regulation (*coercive isomorphism*), C) imitation of other companies, especially leading corporations (*mimetic isomorphism*) and D) compliance with societal values and norms (*normative isomorphism*). (Raucci et al., 2018.)

As can be seen, institutional isomorphism shares some of its features and suggestions with the *legitimacy theory* and *stakeholder theory*. This thesis does not, however, concern itself with determining the relative importance of each theory, but rather assesses the effects of each theory in unison.

4.1.1 Size

While much of the previous studies on the determinants of sustainability reporting have provided mixed results, *size* seems to be a determinant which proves consistent in its effect. This can be largely attributed to the fact that it has received more attention than other determinants (Hahn & Kühnen, 2013.) However, it has to be noted that the underlying reason for its extensive applicability in research lies in the multifarious

ways that increased corporation size may affect actions such as sustainability reporting.

The expected effects of size on the quality and quantity of sustainability reporting are portrayed by both the stakeholder theory and legitimacy theory. Corporate size is argued to have a positive effect on the extent of sustainability reporting:

1) *Stakeholder theory*: as the size of a firm increases, so does the number of stakeholders with varying interests. As the heterogeneity of stakeholder interests increases, so do the requirements for reporting, which again increase the quality and quantity of sustainability reporting – both directly (quantity) and indirectly (quality).

2) *Legitimacy theory*: larger firms tend to be under more public scrutiny, which is expected to lead into an increased need for legitimacy, which can be achieved through improving the quality of reporting and increasing the quantity of reporting (Kolk Perego, 2010).

Larger companies tend to have a more significant impact on external stakeholders, face more external scrutiny – both from a legitimacy and operative viewpoint – and they're expected to be more visible in the society they operate in (Fortanier et al., 2011). These factors suggest that the quality and quantity of sustainability reporting of large companies trump the reporting procedures and outcomes of their smaller counterparts. Larger companies tend to have more resources available for activities outside core business operations, such as reporting (Liu & Anbumozhi, 2009) and lower reporting costs (Jennifer Ho & Taylor, 2007). Further, regulatory boundaries affect large companies in different ways than small companies (see e.g., Finnish corporate legislation, Accounting act of 1997) and size arguably tends to result into more formal processes across the company. Larger firms can also be seen to have "more to lose" due to illegitimacy than small companies and previous research acknowledges a need for large companies, with a diverse set of stakeholders to signal sustainability in order to gain legitimacy (Kuzey & Uyar, 2016).

Therefore, the following hypotheses are formulated:

H1a: Firm size is associated with an increase in the *quantity* of environmental reporting of an organization.

H1b: Firm size is associated with an increase in the *quality* of environmental reporting of an organization.

4.1.2 Industry affiliation

When examining the relationship between industry affiliation and sustainability reporting, the stakeholder theory and legitimacy theory provide the most suitable explanations for the hypothesized effects. As explained in previous sections, previous literature finds that industry affiliation has a strong influence on sustainability reporting. Namely, it is argued that companies within industries that are considered sensitive, *high profile* or which are more inclined to have adverse environmental effects tend to disclose sustainability information at higher rates.

In the context of this thesis, a sensitive industry is defined by adopting the North American Industry Classification System definition into the level 2 classification presented by Thomson Reuters:

Sensitive	**Non-sensitive**
Basic Resources	Technology
Food, Bev. And Tobacc	Banks
Ind. Goods & Services	Media
Utilities	Technology
Construction & Mats	Financial Services
Chemicals	Real Estate
Energy	Telecommunications
	Consumer Prod & Svs
	Retailers
	Drug & Grocery Stores
	Automobiles & Parts
	Insurance

Table 2, Industry classification of companies listed in Helsinki.

In examining possible differences between industries, it is essential to clearly define, what is meant by a sensitive, or a non-sensitive industry. The reason for this is that the definition will inevitably play a significant role in determining the direction and amplitude of the variation that *industry affiliation* will have on dependent variables.

To elaborate, in comparing two distinctly different industries, such as technology and energy production, one will always be able to manufacture a model that provides significant variation but differing definitions of sensitivity might have great impacts on the results. Hence, to outline the definition of *sensitive industry*, in the context of this thesis: a sensitive industry is considered as one which – left to its own devices – is more likely to have a net negative impact on the environment than the average company in a sample.

In the context of stakeholder theory, it can be assumed that companies in sensitive industries will increase the level and quality of sustainability reporting both as a strategic choice (*business-centric*) and due to the moral boundaries set by the environment in which they operate in (*normative*). More sensitive industries are prone to more stringent regulation, and therefore, normative stakeholder pressures arise organically from within the operational environment: the more environmentally sensitive the industry, the greater the probability of increased levels of reporting. On the other hand, increased sustainability reporting as a strategic choice may come to play proactively, for instance through risk management.

Similarly, the suggestions posed by the legitimacy theory on the relationship between sustainability reporting and industry affiliation indicate a positive relationship. Companies which operate in sensitive environments are more likely to come across legitimacy gaps and are therefore inclined to engage in more informative reporting in order to mitigate these issues. Finally, companies in potentially harmful industries may use increased, high quality reporting as a costly signal to differentiate themselves from lower quality companies.

All in all, the theoretical backing for a positive relationship between industry affiliation and levels of sustainability reporting is strong. Therefore, it is hypothesized that:

H2a: Affiliation to an environmentally sensitive is associated with an increase in the quantity of sustainability reporting of a company.

H2b: Affiliation to an environmentally sensitive industry is associated with an increase in the quality of sustainability reporting of a company.

4.1.3 Leverage

Leverage indicates the extent to which a company is financed through debt capital in relation to equity capital. Both the stakeholder theory and legitimacy theory also offer predictions as to the direction of the relationship between the two variables.

The stakeholder theory posits that companies act according to boundaries set by its stakeholders – including creditors. As society becomes increasingly ecologically inclined, it is likely that creditors place more attention on the sustainability performance of the companies they are associated with. As sustainability reports are *de facto* way of indicating adherence to societal environmental requirements, it is hypothesized that companies will choose to report at higher levels in order to increase their prospects of accessing desirable debt capital. Furthermore, it seems likely that highly levered companies will attempt to lower their cost of capital, any means necessary and generally, this can be done through disclosing additional voluntary information (Kuzey & Uyar, 2016). It is hypothesized, though, that given a trend of increased voluntary reporting in general, voluntary environmental reporting is likely to increase as a *side product*.

Shad, Lai, Shamim and McShane (2020) also argue that environmental reporting is related to leverage via cost of capital. It is argued, that if a corporation ignores its sustainability reporting responsibilities, it is not as such a reason for poor abilities to obtain debt capital, but a consequence of losses in competitiveness and productivity, which will also affect abilities to obtain capital at reasonable terms. On the other hand, Gopalakrishnan et al. (2012) find that improving corporate environmental reporting will result to gains in efficiency, improved financial outlook and a higher probability for meeting stakeholder demands. Additionally, scholars argue that firm performance and profitability are enhanced via increased environmental performance. Therefore, companies which report at higher levels, should have a lower systematic risk for loaners which is expected to translate into a lower cost of debt capital. Hence, as debt capital should involve a relatively lower cost for high-level environmental companies, it is likely that their leverage will be higher.

Finally, environmentally inclined investors may be unwilling to invest debt capital into companies which operate with glaring legitimacy gaps resulting from environmental performance. As highly levered companies are generally more likely continue to seek more debt capital to maintain operations, it can be assumed that companies will choose to report at higher levels in order to minimize the risk of ceasing operations due to insufficient funding.

H3a: The quantity of environmental reporting increases with leverage.

H3b: The quality of environmental reporting increases with leverage.

4.1.4 Board composition / Board Gender Diversity

In the context of this thesis, board composition is analyzed through gender diversity. Board composition, in terms of the extent of its gender representation, is perhaps the most intriguing and complex determinant analyzed in this thesis. It seems that while board gender diversity has been studied rather intensively during the last decade or so, establishing theoretical relationships between gender and commonly studied economic metrics remains a challenging task. To elaborate, many papers do indeed base their founding arguments on established theories, but these usually dive deep into the realm of psychological theory, rather than economic, or business theory.

As stated, although empirical evidence for the effect of gender diversity exists, it seems challenging to explain these findings based on economic theories. Therefore, this thesis presents a three-way theoretical foundation for the relationship found between gender and sustainability reporting. The proposed indirect relationship – or relative dynamic – of the determinant and sustainability reporting could perhaps be best described as a loop that *feeds itself*.

A useful way to approach the hypothesized effects of gender diversity on boards is to examine the critical properties of women and men as leaders. As an aggregate, women usually have a higher perception of risks and tend to be more risk averse. Female leaders also tend to represent the quality of caring for the needs of others at a higher rate than their male counterparts, and this is expected to increase the likelihood of

increased CSR efficacy. (Ciocirlan and Pettersson, 2012.) Psychological research also finds that women tend to operate with an increased inclination towards sustainability when comparing to men (Hunter et al., 2004) which is likely to present itself in multiple ways professionally (Bernardi and Threadgill, 2010). Bernardi (2006) also finds that women are more sensitive to ethical issues and more likely to make socially responsible decisions than men. In certain contexts, therefore, it seems that female leaders, as an aggregate, are more likely to provide more preferable outcomes *sustainability-wise* than male leaders.

The legitimacy theory offers valuable predictions as to the direction of the relationship between board composition and sustainability reporting. However, this effect seems to be indirect. The legitimacy theory suggests that companies will use certain tools to combat existing and possible emergent gaps in legitimacy. As sustainability is considered to consist of three components – social, economic and environmental – the trend of increased female leadership, although arguably limited (e.g., McKinsey, 2020), can be *partly* attributed to the willingness to mitigate the risks of creating social legitimacy gaps through operating with an all-male board. As the number of women leaders increases, it is likely that the attributes they hold – as outlined previously – start to affect the operations of the company. In this case, it is hypothesized that increased female leadership and the subsequent relative increase in environmental awareness will result into increased environmental reporting.

During the past decades, CSR has become increasingly important for shareholders across the spectrum (Kudlak, Szocs, Krumay & Martinuzzi, 2018). It is expected that this increased importance manifests itself as increased demand for higher quality CSR reporting. As shareholders seek increased environmental awareness from companies, they are likely to look for leaders, who are more inclined to fully adhere to presented shareholder requirements. Women, who are generally more risk averse, indeed seem more likely to comprehensively cater to shareholder's needs in this sense. Women on boards contribute to an increased awareness of CSR, and therefore, in an environment where CSR issues are emphasized by shareholders to an ever-higher degree, it seems likely that the presence of women on boards will result into higher quality sustainability reporting.

H3a: The number of female board members is associated with an increase in the quantity of sustainability reporting.

H3b: The number of female board members is associated with an increase in the quality of sustainability reporting.

It has to be noted, though, that this effect can be somewhat characterized as *indirect*. Where relationships of determinants such as *size* and *industry affiliation* are fully explained by traditional business theory, for board composition, traditional theories only explain the underlying reasoning for increased female leadership. This thesis hypothesizes that in practice, increases in female leadership can be explained by A) psychological evidence, B) business theory and perhaps most importantly, C) institutional isomorphism.

In simple terms, while explanations can also be found from business theory and psychological theory, it seems likely that companies adopt established policies, which have been tried and tested. In the context of increased female leadership and high-quality sustainability reporting, this thesis expects that a significant portion of the effect is explained by companies copying their peers, which have found success in CSR reporting by increasing the number of female board members. It has to be

emphasized, that isomorphism is not – as such – an area of research interest in this thesis. However, it is imperative, that one acknowledges the practical effects of isomorphism, and that they are likely to affect hypothesized relationship dynamics vastly.

4.1.5 Profitability

Profitability is likely to have a significant effect on reporting for a number of reasons. The underlying assumption is outlined by the legitimacy theory; companies are forced to disclose environmental information for the sake of legitimizing their activities (Legendre & Coderre, 2012). The assumption in terms of highly profitable companies is that they may face more scrutiny for their actions: it may be perceived that they are utilizing shared resources – both social and environmental – at harmful rates in order to facilitate their profitability. Companies strive to ensure access to scarce resources, and profitable companies are likely to require more of these resources. Reverte (2009) notes that reporting practices are tools which companies can use to ensure access to economic resources. Additionally, a firm's economic performance plainly might not be sustainable if it fully disregards public interest in environmental issues (Kuzey & Uyar, 2016).

In addition to plain necessity, profitable companies may have other motives for high-level sustainability reporting. High level sustainability reporting might also be a matter of ensuring that the public has positive image of highly profitable companies. Profitable companies also tend to have the financial capacity to increase the quantity and quality of their environmental disclosures, whereas less profitable counterparts may be forced to prioritize otherwise (Simnett et al., 2009).

H4a: Profitability is associated with an increase in the quantity of environmental disclosure of a company.

H4b: Profitability is associated with an increase in the quality of environmental disclosure of a company.

4.1.6 Ownership structure

In the context of this thesis, ownership structure refers to whether the Finnish state – through Solidium, a state-owned investment company – is among the major shareholders of the company. Solidium holds several key positions in Finnish companies and it is assumed that the financial and strategic goals of the state affect the operations of these companies in various ways (Solidium, 2020). In general, it can be assumed that these companies are scrutinized more rigorously as to how their operations affect their stakeholders. Specifically, the budgetary confinements of state-owned corporations are often loose, and are therefore expected to have an increased focus on creating well-being both societally and environmentally, in addition to financial returns.

The stakeholder theory and legitimacy theory suggest that companies are forced to act according to stakeholder demands, and that legitimacy gaps may occur, which then again, may harm company operations. With state-owned corporations, it is safe to assume that *stakeholder demands* are more stringent. Similarly, as states tend to be risk averse when it comes to adverse environmental and social outcomes, it is likely that the tolerance for illegitimacy is low.

H5a: State ownership is associated with an increase in the quantity of environmental disclosure of a company.

H5b: State ownership is associated with an increase in the quality of environmental disclosure of a company.

4.2 Sample

The sample consists of the annual reports and/or sustainability/CSR reports of Finnish listed companies. Sample reports were collected from companies listed on the Helsinki Stock Exchange (Nasdaq Helsinki). Of the 129 listed corporations, 108 provided reports which were suitable for analysis in this thesis; in letter steps of the study, the number of analyzed reports was brought down to 96 due to data limitations. As the coding structure utilizes a list of English key words, and the processing of language

relies on English grammar and syntax, using Finnish as the main language of investor communication renders companies' reports worthless for this study; such companies' reports were not taken into account. Standalone sustainability reports or GRI-based supplements were found from 40 companies. On the other end of the spectrum, nine companies failed to include any environmental disclosures in their reporting, and 12 companies only included a brief, generalized note on environmental matters.

The premise for data collection is that for each unit of analysis, the *highest form* of reporting that was readily available for analysis was chosen – i.e., the form which is most informative as per criteria outlined in this thesis. It is to be noted that the highest form of disclosure might not always be a report *per se*. Regardless of the source, only environmental disclosures were taken into count, other sections of the report or text were discarded. In practice, a primitive hierarchy of reports was formed, from highest to lowest *form*:

1) **Standalone CSR/sustainability report (along with a GRI supplement, if available)**: the primary objective for gathering data is to locate a sustainability report for each company, as this is assumed to provide the highest informational value in terms of environmental data.
2) **Annual report which includes sustainability disclosure (along with a GRI supplement, if available)**: if a sustainability report is not available, an annual report is taken as the unit of analysis.
3) **Annual report**: if annual reports do not include a separate section for sustainability disclosures, it is determined whether a general note on sustainability is present in the report. These general notes are then extracted for analysis.
4) **No sustainability report whatsoever:** if none of the mentioned criteria are met, it is determined that the company has not disclosed environmental information.

All company-specific variables other than state ownership and board composition were collected from Thomson Reuters Data Stream. Remaining data was collected from company websites. Table 3 outlines the variables used in the analysis and whether or not a dummy variable was used:

Variable	Indicator	Variable Type
Size	Assets	Continuous
Leverage	Debt-to-capital ratio%	Continuous
Profitability	Net Profit Margin	Continuous
Board Composition	Female Representation % / Fem. Rep > 3	Continuous / Dummy (0/1)
Industry affiliation	Sensitive Industry	Dummy (0/1)

Table 3: outline of variables used in analysis

Variable indicators were chosen based on their informative qualities. That is to say, indicators were chosen on the basis of A) how well and consistently they represent the underlying business operations-related decisions that lead into the perceived variable levels and B) their objectivity – in that they are not suspect to deviations resulting from accounting-based redressals or differences in calculation principles. As will be shown in the following sections, binary dummy variables were used to represent board composition and industry affiliation. In the case of board composition, the variable is also tested as a continuous variable via percentage.

4.2.1 Initial analysis & collection

This thesis concerns itself with Finnish listed companies. All data was collected based on Nasdaq Helsinki listings; both Main Market and First North. 2019 annual disclosures were used for each unit of analysis. Companies that have had structural changes (M&A) or have listed or de-listed during the past year are not taken into count. Companies with multiple series of stocks are taken as a single unit of analysis.

As presented above, if a standalone sustainability report is available, this is chosen for analysis as this is seen as the highest level of environmental reporting for a given company. For those companies which include their sustainability report within the annual report, environmental disclosures are extracted from the report by use of primitive key word searches[10] and manual search. If no sustainability disclosures are included in the report, it is determined whether a general note or comment on

[10] The phrases *sustainability, responsibility, environment* and *non-financial disclosure* (as per Finnish reporting standards) were used for this phase.

environmental sustainability is present. When present, these are extracted to represent the highest form of environmental disclosure for a company. Those companies which fail to disclose environmental matters are noted and are taken into analysis as *null*.

Annual reports, CSR/sustainability reports and GRI supplements were collected from companies' websites and converted into Word documents for further pre-processing. In the subsequent step of pre-processing, environmental disclosures are extracted from each report to ensure that quantity-measures remain representative and are not skewed by additional information, unrelated to environmental reporting. If an ESG supplement is provided – in addition to an annual report or a sustainability report – by the company, this is analyzed to determine whether this provides information that is not available on other official reports. If such information is present, it is added onto the extracted environmental disclosure; otherwise, supplements are discarded. [11] In essence, reports are processed to the degree where only sections specifically concerning environmental activities remain.

4.3 Automating content analysis

Initial data collection and analysis – as outlined above – was followed by the creation of a software to analyze texts. In essence, it was decided that content analysis should be somewhat automated to ensure A) that the number of entries will be sufficient to offer valuable insights across the spectrum and B) that the obtained results remain objective throughout the process.

When discussing a shift from assessing the disclosures of companies manually to analyzing these in an automated fashion, one is fundamentally proposing a paradigm shift as to the methods and timing by which reporting is analyzed. To elaborate: when a person reads, assesses and analyzes a company disclosure, they are inherently analyzing the quantity and quality of the disclosure at the same moment in time. That is, while reading the disclosure, they will determine what items were disclosed and at

[11] E.g. In some cases, the sustainability report included very little environmental information, but the GRI supplement included in the report pointed out the sections of the annual report which focused on said information. In these cases, excerpts from the annual report were taken into count.

what breadth (quantity of disclosure) as well as how well these have been disclosed (quality) simultaneously. Although analyzing the quantity and quality of a disclosure in unison is no doubt effective, the issue lies in the fact the two are inextricably linked. A tendency for high *quantity* disclosures to be also perceived as high *quality* will likely persevere, and this is bound to skew obtained results into a way or another. The model proposed in this thesis accounts for these limitations. A two-step software solution is proposed, through which the quantity and quality of disclosures are analyzed as distinctly separate entities.

Another point to acknowledge concerning the automation of analysis – and what is extremely challenging to demonstrate to scholars, who have not engaged in the automation of similar processes – is its difficulty. These processes truly stipulate a comprehensive shift in thinking. To elaborate, humans have a tendency to forget – and harshly underestimate – their capabilities in analyzing texts. That is, scholars rarely understand how well, and how fast they – as humans, as opposed to machines – are able to sort out intricate pieces of information from texts. Above all, it is essential to internalize the notion that text analysis and processing is a multi-step process, which involves a number of complex assessments – and in automating such analyses, these steps have to be either coded into software solutions, or they have to be simplified in a manner that is comprehendible by a computer.

The outline of the methodological structure is portrayed in figure 1. What follows is a comprehensive summary of the steps required for creating a semi-automated content analysis software which can be utilized in analyzing environmental disclosures. As will be shown, the coding structure proposed in this thesis is also highly utilizable in settings other than sustainability reporting. As the list of key phrases determines the functions of the software to a relatively high extent, applying this structure to other applications is straight-forward. It is expected that section of the code involving quality, in particular, may prove valuable in assessing the information value of other texts alongside sustainability disclosures.

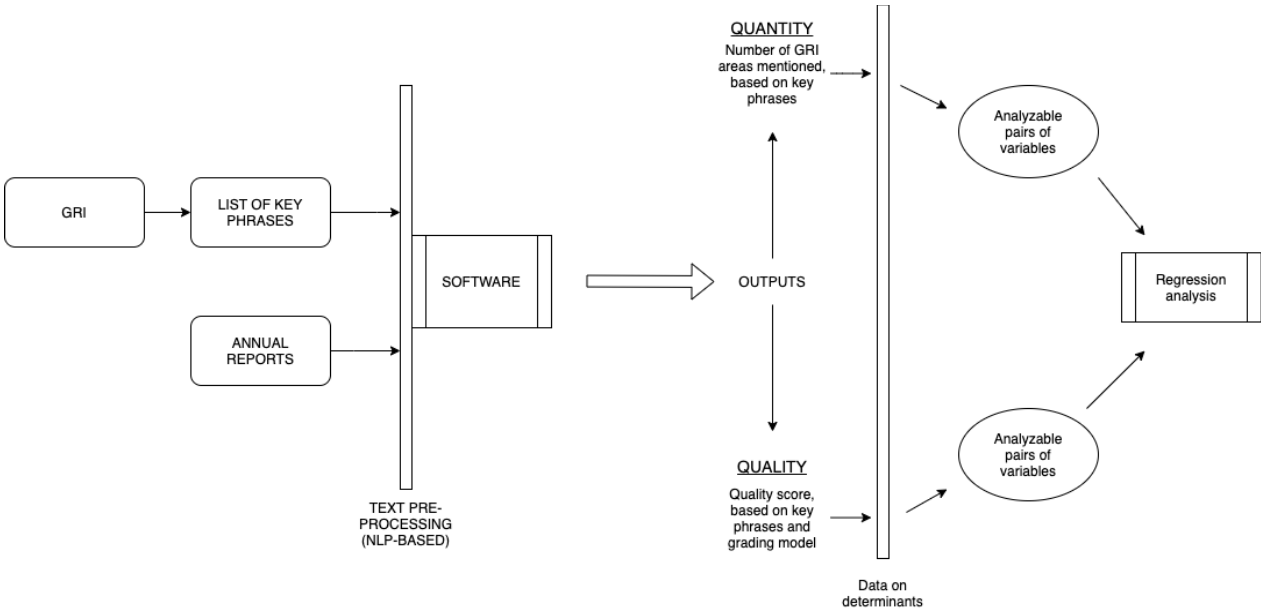

Figure 1, outline of methodological structure

4.4 Content analysis software

What cannot be overstated, is the fact that software development is a highly iterative process. Figure 2 outlines the steps that were taken in order to create a Python-based automated content analysis tool

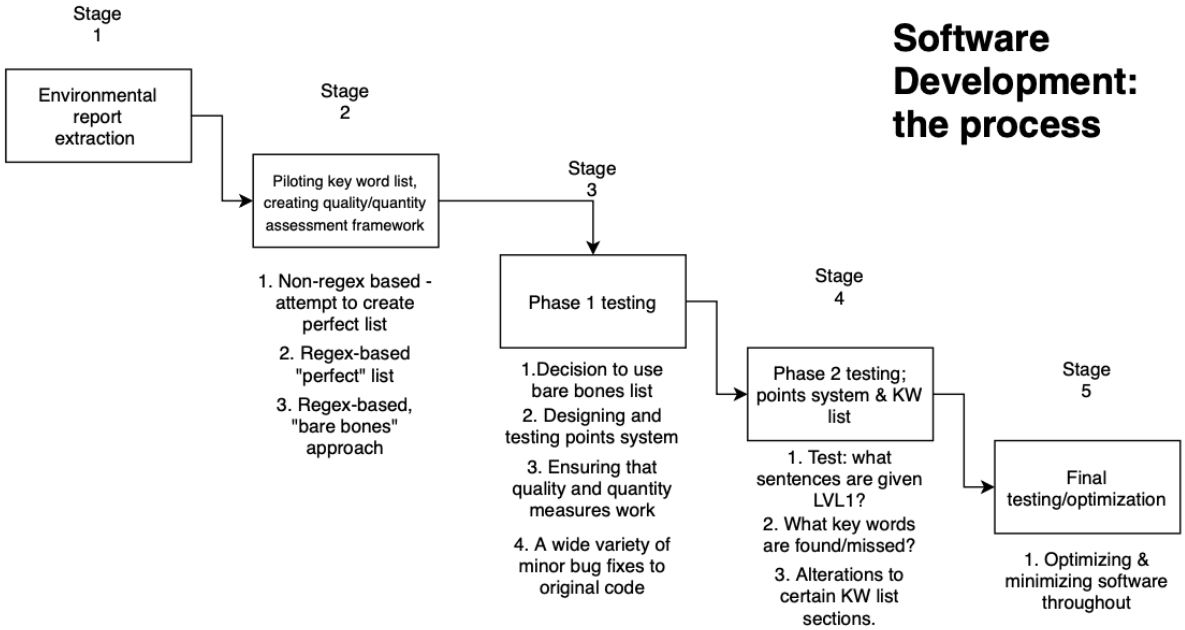

Figure 2, flowchart of the development process

The process starts with manually extracting sustainability reports from company annual reports and ends with optimization and testing in stage 5. The steps taken – and the reasoning behind certain decisions – are outlined in upcoming sections.

4.4.1 Stage 1: Text pre-processing

In order to ensure that content analysis provided accurate results, pre-processing is required. Here, text was manipulated so that it becomes accurately analyzable for the software. Pre-processing was done to both the list of key phrases and the analyzable texts themselves in order to ensure accurate results.

As the software incorporates no form of machine learning algorithms which could accurately identify the portion of sustainability on a given report, the first step of text pre-processing was to extract environmental disclosures from reports. This was done manually. Of ESG (environmental, social and governance) reports, only environmental sections were extracted. These excerpts were then exported as word documents in order to ensure compatibility with the software.

In addition to preliminary processing, another manual check was made in stage 3 testing to ensure that all excerpts were treated equally. This proved crucial, as some disclosures incorporated a structure that did not clearly divide reports into coherent environmental, social and governance-related sections. All social and governance-related disclosures were discarded from analyzed documents.

Natural language processing (NLP) packages were initially planned to be used in order to process the text further. However, even though NLP offers significant advantages, these become redundant once regular expressions (regex) were used to create key phrases. The main advantages of NLP include condensing words to their basic form, but the possibility of utilizing regex to search for all conceivable variations of words proved superior in molding text into an analyzable form.

4.4.2 Stage 2: List of Key Phrases

A key word list was used for both sections of the content analysis. The decision to use a list of key phrases for analysis arises from the fact that it is the only viable alternative available for this type of research at this time. Optimally, such analyses would be conducted by utilizing machine learning algorithms, but due to several resource-related limitations, it was deemed unreasonable for this thesis. As will be shown in upcoming sections, the role of the key phrase list is to determine whether an item is disclosed. This information is then used as the backbone of quality analysis and in determining the breadth of disclosures.

This is perhaps the most important section of the entire software, as it determines its scope, effectiveness, accuracy and the utility of the software itself. The intricacy of designing an effective list of key phrases is outlined by the level of difficulties that became evident through various stages of trial and error. Essentially, a harsh dichotomy exists when it comes to designing a list of key phrases. Generally speaking, it is impossible to generate perfect key phrases – in that the terms indicate matches for all possible variations of search term but disregards all unrelated words and sentences. More often than not, the attempt to create perfect search phrases is futile. Take an example of a proposed regular expression, which outlines the logic used to create key phrases:

((produc[a-z]{1,4}(of\)\|) (import[a-z]{0,3}(and\)\|) export[a-z]{0,3}\|)(of\)(ods\| ozone depleting substances) ((in(metric\|) ton[a-z]{0,1} of\)) (cfc 11\| trichlorofluoromethane) equivalent

which searches for a combination of the following words:

"production of" OR "importing" AND/OR "exporting" of ods in metric tons of cfc equivalent

This search term is indeed *accurate*, in that it only provides matches when ODSs (ozone-depleting substances) are disclosed in unison to CFC (chlorofluorocarbons)

equivalents. However, the use of additional, defining terms[12] is likely to become redundant: in the context of sustainability disclosures, the likelihood that the term ODS, or ozone depleting substances is used to disclose another matter than the amount of ODS as per CFCs equivalents is miniscule. Therefore, using a search term such as this proves inefficient, mostly redundant and inaccurate – and should be condensed further for best results.

It can be assumed, with high probability, that ODSs are likely to be disclosed per a comparative measure, such as *metric tons*. Additionally, as the function of the key word list is to provide an indication of whether or not a certain item is disclosed, or not, assessing the accuracy of the statement is irrelevant at this point. Finally, in the context of a GRI-based sustainability report, the production, importing and exporting of ODSs all concern disclosure 305-6[13]. We can therefore assume, with very high probability, that any reference to the term "ODS" is disclosing an item related to GRI 305-6 (emissions of ozone-depleting substances), i.e., the production, importing or exporting of such chemicals.

Thus, the search term for the sentence(s):

"production of" OR "importing" AND/OR "exporting" of ods in metric tons of cfc equivalent

Condenses to only contain the possible variations of the most crucial search term, the chemical, or disclosable item itself:

"\sods\s|ozone deplet[a-z]{1,3}"[14]

Attempting to create a perfect list not only creates redundancies, but it may also result into less accurate or skewed results. Looking back to the example above, we find that

[12] In this case "additional, defining terms" can be understood to refer to all terms contained in the sentence, other than the chemicals themselves – ODSs and CFCs.
[13] See GRI 305-6, section 2.3.
[14] i.e. "any whitespace character" + ods OR "ozone deplet" + (-ing, -ion, etc.). Please see appendix 4 for outline of regular expressions.

terms which define the way, form or accuracy of the disclosure (e.g., how much of a given substance is emitted, and how) are often bound by their syntax. That is, they are usually related, and deeply interconnected to the terms following or preceding them: for example, "metric tons" is often preceded by the name of a given substance and followed by a unit of measure for comparison, e.g., "…of CFC equivalent". Therefore, even though scholars would optimally desire to only account for sentences which fully disclose the matter (i.e., includes A) the substance B) unit and C) universal term for the use of comparison), they should aim on generating a *bare-bones* search term, which only includes the most fundamental requirements for indicating a match – one that will provide, with high certainty, a match to the disclosed item, but one that will not provide matches for other items.

Another factor advocating an approach outlined above is the issue of varying syntax. 'Perfect'[15] search terms will likely fail to indicate matches for disclosures that are split into more than one sentence. Theoretically speaking, a sentence should contain one complete, coherent idea or item, and full stops generally act as dividers that are used to distinguish an item for another, but this is naturally not always the case. Therefore, condensing search terms into their fundamentals is required to mitigate the effects of such discrepancies.

In other words, the design of the list of key phrases is certainly a case of choosing between two alternatives: redundancy and a high likelihood of missed disclosures (in attempting to create a perfect key word list) or maximizing the likelihood that all disclosed items are indeed found by the software; and accepting a small possibility of errors via false indications of disclosed items (through a *bare bones* approach). While both alternatives have their shortcomings, it is essential to remember that the function for the software – at this stage – is to indicate, whether an attempt was made to disclose an item, as requested by the GRI framework, or not. In other words, at this stage, the software does not analyze the rate, or extent to which an item has been disclosed as

[15] Perfect search term = a term which only provides matches when all requirements for the disclosure are met (substance, unit, comparative measure, additional information).

per GRI. The rate and extent to which an item is disclosed is analyzed separately, through quality measures proposed in later sections.

From here, regular expressions (regex) were used to generate search terms for each key word or phrase. Regex involves a pattern which outlines a search term, or describes a given amount of text (Goyvaerts, 2016). The reason for the use of regex in determining whether key phrases are mentioned in analyzed texts stems from simplifying the code as well as being able to search for a large number of combinations and variations of words with a single search phrase. Regex uses several metacharacters in its syntax to indicate different expressions; these characters indicate what to match to a certain word or a word combination, and how many times to match it. See appendix 4 for an outline of how regex, and its metacharacters were used in creating the key phrase list.

Key phrases were generated for all 33 sections of GRI. The number of key phrases ranged from 3 to 20, depending on the number of required disclosable items. It should be noted that there is significant overlap between certain GRI sections when it comes to the disclosable items. Without intervention, this overlap results into inaccurate data, as the software indicates matches for multiple sections on the basis of a single word or phrase. On the other hand, if one were to disregard these search terms entirely, it is almost certain that the software would have missed a significant portion of disclosed items relating to these sections. For example, multiple subsections of *GRI 305, emissions* require disclosing the amount of emissions by the type of gas:

ch4|ch4
n2o|n2o
hfc.
pfc.
sf6|sf6
nf3|nf3
co2|carbon dioxide|co2
gwp|global warming potential
methane
hydrofluorocarbon[a-z]{0,1}
perfluorinated compound[a-z]{0,1}
sulfur hexafluoride
nitrogen trifluoride

Therefore, to ensure that: A) the software does not indicate multiple matches for a single word[16], and that B) all possible variations of disclosing an item are recognized, *additional 'GRI' sections* were made for these key words[17]. Additional key word sections were created for GRI 303 (water) and GRI 305 (emissions). In both cases GRI requirements include disclosing emissions or water withdrawal by type: emissions disclosures are outlined above, and in the case of GRI 303, water discharges and withdrawals are to be disclosed from groundwater, surface water, stressed water sources, and so on. Finally, an additional subsection was also created for consumption-related calculation methods for similar reasons as above.

4.4.3 Stage 2: Content Analysis Software, Technical Aspects

The content analysis software itself has two distinct functions. The first determines the quantity of disclosure, and the second analyzes the report for quality. As stated, in the context of this thesis, the measure of quality can essentially be characterized as *the rate of informativeness*, i.e., how informative are the sentences in the disclosure, or *information per sentence*.

The software is based on object-oriented programming. In simple terms, this means that individual entities – objects – are created, which have certain characteristics. Characteristics can either be features, or actions. Features are, in this context, any number or text, which characterize the object. Actions, on the other hand, are methods which execute something. Again, in simple terms, these characteristics are used to inform the object firstly, as to what it is reading, then how to read it, and so on. Technically speaking, some preliminary processing is also done within the software itself amongst programming the software to comprehend the analyzable files. For example, all text is made lower case, quotation marks are modified to an identical

[16] For example, without this workaround, the use of the term "CH4" in a disclosure would have resulted into matches in all GRI sections between 305-1 and 305-5. On the other hand, it was found that, if the term "CH4" is not used as a search term, a significant portion of emissions-related disclosures are disregarded in analysis.
[17] Sections "303-6" and "305-8" in the list of key phrases, respectively. See appendix 4 for list.

format and several verifications are made to ensure that the correct sections of both the disclosure and key phrase list are taken into count.

Several Python packages were used to create the software. These include, for example, packages that are used to read tables, read word documents, read and write excel documents, and so on.

4.4.4 Stage 2: Content Analysis Software, Quantity

The first step of the analysis involves determining the quantity, i.e., breadth of environmental disclosure. One is reminded that the analyzable disclosures have been pre-processed to only include environmental information, regardless of whether the original document consisted of an annual report or a sustainability report.

Quantity is determined with three parameters, the first two of which are straight-forward: *word count* and *sentence count*. Studies (e.g. Deegan & Gordon, 1996; Zéghal & Ahmed, 1990) support measuring the volume of disclosure through word count for the sake of creating a deeper understanding of the extent of disclosure. Proponents of sentence count (e.g. Hackston & Milne, 1996) believe that sentences can be counted with higher accuracy than individual words. Additionally, these proponents have found that counting sentences provides a deeper understanding of meaning, and that the isolation of words may prove problematic. However, these suggestions are arguably dated in their outlook, in that more sophisticated content analysis methods are available – and that using a combination of these methods likely ultimately provides superior results. Additionally, many of the areas which scholars of the era find problematic in content analysis – for example, the conflation of units (Milne & Adler, 1999) and ignoring the adverse effects of grammar (Unerman, 2000) – are comprehensively mitigated through pre-processing the text. Therefore, the usage of natural language processing, in addition to utilizing multiple measures of quantity – which generally was not an option for earlier scholars – is expected to provide accurate results.

Finally, disclosure volume is measured in terms of how many of the required areas of GRI are disclosed in the report. Key phrases have been assigned to GRI sections 301-

308, including all of their subsections. This acts as a *checklist*, in that the software is designed to indicate whether or not a given section is mentioned in the disclosure as per the prevalence of key phrases. Altogether, there are 33 sections for this checklist; GRI 301 through 308, including their subsections, of which there are between one and seven, depending on the section.

Therefore, the output for this function of the quantity-related section of the software involves three data points for each company: 1) word count, 2) sentence count and 3) a quantity score, the maximum number of points for which is 33.

4.4.5 Stage 2: Content Analysis Software, Quality

Quality assessment is – without a doubt – the most contestable section of this thesis. It is generally acknowledged that determining the quality of any entity is often highly subjective and dependent on the underlying assumptions of the scholar. However, to ensure that an accurate picture of sustainability performance is obtained, it is essential to consider quality implications in addition to the volume of disclosures (Toms, 2002).

Regarding CSR disclosures, Robertson and Nicholson (1996) find that the "ideal model" of disclosure involves closing the gap between rhetoric and action. They state that corporate sustainability reports consist of three levels of disclosure, varying in informative value: A) general rhetoric, B) describing specific endeavors, i.e., concrete CSR actions and C) implementation and monitoring. The general understanding of high-level sustainability reporting is that companies should not only focus on issuing statements on their commitments, but also emphasize how these commitments have been fulfilled and elaborate on the achieved outcomes (Boutena et al., 2011). Gurthie and Mathews (1985) argue that a sense of quality regarding a statement arises from whether it is declarative, monetary-quantitative or non-monetary quantitative.

Therefore, it seems evident that the utmost measure of quality is the informative value of the content disclosed in a report. Informative quality, in this respect is assumed to rise from the company's ability to quantify and offer backing for both their commitments and the fulfillment of these commitments. For quantifiably analyzing the quality of disclosures, this thesis adopts an approach based on CONI (consolidated

narrative interrogation), a model created by Beck, Campbell and Phillips (2010). The approach is slightly modified in order to adopt it to the semi-automated approach used in this thesis. This involves some limitations compared to the original approach, mainly in terms of accounting for content diversity, but adopts both volumetric (see section 4.2.4, quantity) and information content[18] approaches.

Beck et al. (2010) assess the informative value of disclosed content on a scale of one to five. The lowest level of informative value – or disclosure quality – is purely narrative, and the highest representation of quality, level five involves both numeric and year-to-year measures, making the statement descriptive, quantitative and comparable (Beck et al., 2011).

For this thesis, it was decided that the quality of disclosure should be assessed sentence by sentence. A scale of one to four was used. In other words, each sentence is appointed a quality score and the quality of the entire report was generated by calculating an average score for each included sentence. The lowest level of disclosure was considered to be a sentence which only regards environmental matters on a very general level; following on the lines of Beck et al., (2010, 213.), who characterize this level as "address[ing an] issue related to category definition, purely narrative". Level two sentences are those which address a specific issue related to environmental disclosures. These specific issues are identified by using the list of key phrases covered in the previous section. Level three sentences are considered as those which define a certain GRI issue – as per the list of key phrases – and include a numeric quantifier for the statement. Numeric quantifiers, at this stage, can be either values, percentages or fractions. A sentence is considered to be of the highest quality if it includes a specific GRI issue, a numeric quantifier and a year-to-year or a quarterly comparative indicator.

[18] See appendix 3 for the outline of the model.

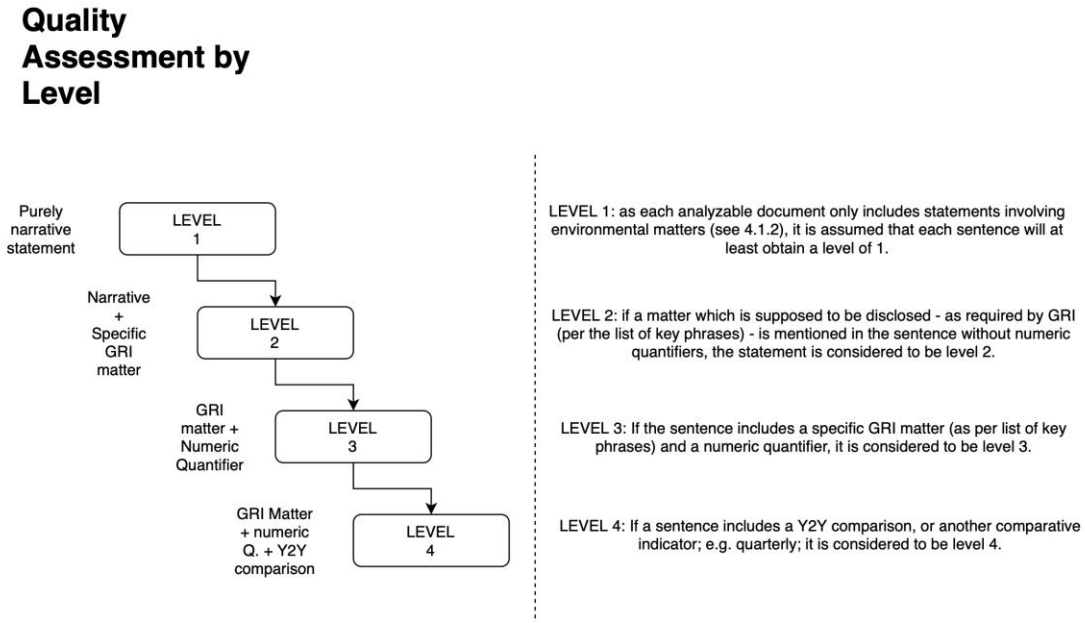

Figure 3. Illustration of quality, i.e., informative value, scale of 1-4

4.4.6 Stages 3-5: testing and optimization

It should be reinstated that software development – at least in the context of this thesis – is a highly iterative process and involves several steps of fixes and alterations as well as inclusions and exclusions.

Stage 3 'testing' mainly revolved around the key word list and designing the quantity and quality measures. Firstly, the decision to go with a *bare necessities* approach with the key word list was chosen. First attempts of generating a list of key phrases involved several piloted versions, such as a comprehensive, sentence-based approach where an attempt was made to generate all possible variations of sentences that could be used to disclose items as per GRI. Additionally, at this time, an attempt was made to generate singular, all-encompassing search terms for each GRI section using regex. Both of these approaches were ultimately discarded, but for differing reasons. The sentence-based approach was discarded due to the fact that it did not provide accurate results: as discussed in previous sections, it is near impossible to create a sentence for each possible variation of the ways that can be used to disclose a certain item. This approach

resulted into a large number of missed disclosures. On the other hand, technical aspects led into the dismissal of the all-encompassing approach. It became evident, that it is impossible to generate a search term that accounts for all possible variations and words that can be used to disclose a certain item.

Stage 4 involved rigorous testing of the points system, as well as fixes to the key phrase list. In order to ensure that the key phrase list contains all possible variations of important words, all level 1[19] sentences were assessed. The main goal regarding this procedure was to be able to determine the words, or variations of words that were not yet present in the list of key phrases. Additionally, a list of found and missed keywords was manually analyzed to delete redundant key words, and to alter keywords in a manner that they only indicate matches with desirable phrases.

What is notable about the fourth stage of the process, is the optimization of testing. Initial testing was limited to those disclosures which are shorter in length in order to be able to more efficiently locate missing key words or phrases. Afterwards, longer reports were used for testing. It could be stated that '*common sense*' is required in this type of testing. As short disclosures are less likely to use a wide array of phraseology, the very shortest of disclosures are extremely unlikely to provide additions to the key word list, and thus these were mostly disregarded.

The final stage of testing revolved around traditional software-based optimization of the coding structure. In addition to optimization procedures, the final stages of the process involved a manual check of obtained data, as well as a cursory sifting of company reports once more to verify software findings. This verification included manual assessments of the points system as well as other data throughout.

[19] Sentences, which only vaguely relate to sustainability, no specific mention of a GRI item. See 4.3.5 for more information.

5 FINDINGS & ANALYSIS

The aims of this thesis are two-fold. As one of the main goals of this thesis is to provide a framework by which to create a novel, automated software solution for analyzing the content of sustainability reports, it could be argued that the methodology – as presented earlier – already acts as an account of the findings of this thesis. The success of the implementation and accuracy of results will be discussed in the following section.

5.1 Software

The aim of this thesis is to:

> *"... create a highly objective way of analyzing, scoring and ranking the environmental reports of companies – both in terms of quantity and quality – via an automated, novel, Python-based software solution. In this sense, the main areas of importance for the software are A) enabling comparability between reports, B) the unconditional objectivity of analysis and C) ensuring the ability to analyze large quantities of reports simultaneously."*

It can be said, without a doubt, that this thesis has been successful in terms of the requirements posed in the very beginning. As such, due to the fact that text is often difficult to analyze objectively, the main function of the software solution was to be able to condense text into comparable figures. The outputs of the software include:

Output Data	Explanation
Company Name or Identifier	-
Sentence Count	-
Word Count	-
Average Quality Score	Each sentence was given a quality score ranging from 1 to 4, based on the grading framework outlined previously. Simple average of all sentences contained in the report.
Number of Level 1 Sentences	Number of narrative sentences, as per framework outlined previously.
Number of Level 2 Sentences	Number of GRI-specific, yet narrative sentences, as per framework outlined previously.

Number of Level 3 Sentences	Number of sentences containing a GRI keyword and a numerical quantifier.
Number of Level 4 Sentences	Number of sentences containing a keyword, numerical quantifier and a time indicator.
GRI Section Coverage	Percentage of GRI sections covered in report.
Checklist of Covered GRI sections	List of all GRI sections – 301-1 to 308-2 – divided by sub-section. Number of keywords mentioned by GRI section.

Below is an example of the output data for two companies contained in the sample:

Company ID	Sentences	Words	AVG sentence lvl	lvl1	lvl2	lvl3	lvl4	Covered sections (%)
A	62	1423	1,387096774	52	3	0	7	14,28571429
B	96	2138	1,40625	76	8	5	7	40

301-1	301-2	301-3	302-1	302-2	302-3	302-4	302-5	302-6	303-1	303-2	303-3
0	0	0	2	0	0	2	4	0	0	0	0
2	0	0	2	0	1	4	4	0	0	0	0
303-4	**303-5**	**303-6**	**304-1**	**304-2**	**304-3**	**304-4**	**305-1**	**305-2**	**305-3**	**305-4**	**305-5**
0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	0	0	0	0	3	0	1	1	1

305-6	305-7	305-8	306-1	306-2	306-3	306-4	306-5	307-1	308-1	308-2
0	0	1	0	1	0	0	0	0	0	0
0	0	5	1	0	0	0	0	0	0	0

As can be seen, to state that the possibilities for analyses based on the output data of the software are plentiful, is an understatement. One is reminded, that all metrics are based on objective frameworks, and as is evident, the rate of comparability is extremely high. The output data offers scholars the possibility to rank, analyze and compare corporations on 43 metrics, most of which offer deep and comprehensive insight into even the most specific measures of corporate sustainability. In ranking companies per different measures, scholars can use data to identify trends and clusters, while investors and managers may find use for the software in benchmarking, for instance.

Companies, which rank highest in environmental reporting quality are Alma Media, Vaisala, Fortum, Terveystalo and Metso; in no particular order, the highest of which

obtaining a quality score of 2,175 out of 4. Companies with most comprehensive reports, on the other hand, include Outotec, Kemira, Fortum, Wärtsilä and Tikkurila, covering the highest covering 82% of required GRI sections. Both in terms of quantity and quality, the poorest companies scored the lowest possible scores, 0 and 1, respectively. The results are discussed further in the upcoming sections.

5.2 Descriptive statistics & Preliminary findings

The main empirical aim of this thesis is to investigate how company-specific factors affect the way in which organizations engage in sustainability reporting. Specifically, it was hypothesized that:

$H1_{a/b}$: Firm size is positively associated with both sustainability reporting quality and quantity,

$H2_{a/b}$: Affiliation to an environmentally sensitive industry is positively associated with both reporting quality and quantity,

$H3_{a/b}$: Leverage is positively associated with sustainability reporting quality and quantity,

$H4_{a/b}$: The presence of woman board members has a positive effect on the quality and quantity of environmental reporting,

$H5_{a/b}$: Profitability is positively associated with sustainability reporting quality and quantity,

$H6_{a/b}$: State ownership has a positive effect on sustainability reporting quantity and quality, and

$H7_{a/b}$: Company growth is positively associated with sustainability reporting quality and quantity.

The sample used for this thesis consists of the annual reports and/or sustainability/CSR reports of Finnish listed companies. Sample reports were collected from companies listed in the Helsinki Stock Exchange (Nasdaq Helsinki). Of the 129 listed corporations, 108 provided reports which were suitable for analysis in this thesis. Standalone sustainability reports or GRI-based supplements were found from 40

companies. On the other end of the spectrum, nine companies failed to include any environmental disclosures in their reporting and 12 companies only included a brief, generalized note on environmental matters. Due to practical data availability-related limitations, the number of analyzed documents was 96, two of which did not provide a sustainability report, and were taken into analysis as null.

5.2.1 Content analysis results

The software outputs include sentence count, word count, the average level of sentences, the number of level 1-4 sentences present in the document and a breakdown of the number of sentences concerning each of the GRI sections (301-1 to 308-2). The following table presents the most important preliminary findings:

Table 4, descriptive statistics of preliminary findings

	Sentences	*Words*	*AVG sentence lvl*	*lvl1*	*lvl2*	*lvl3*	*lvl4*	*Covered sections (%)*
Mean	149,98	3479,93	1,35	118,57	14,98	9,76	6,67	24,82
S.E	24,22	600,21	0,03	22,56	1,78	1,44	1,14	2,01
Med.	78,50	1618,50	1,34	54,50	8,50	4,00	3,00	20,00
Mod.	36,00	216,00	1,00	14,00	5,00	0,00	0,00	8,57
S.D	237,34	5880,81	0,33	221,00	17,43	14,14	11,22	19,74
Var.	56330	34583881	0	48840	304	200	126	390
Kurt.	20,04	23,41	5,01	27,98	2,45	7,56	16,61	-0,17
Skew.	3,96	4,29	-0,92	4,84	1,67	2,43	3,60	0,79
Range	1643	42553	2	1617	79	83	75	77
Min.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Max.	1643	42553	2	1617	79	83	75	77

The average document contains 150 sentences, or approximately 3500 words, which is slightly underwhelming considering the breadth at which many companies disclose other end-of-year information. For reference, the most end-of-year reports exceed 100 pages (approx. 25 000 to 50 000 words), some exceeding the 200-page mark. Granted, the standard deviations of both word and sentence count vastly exceed the mean, which indicates an extremely high spread, in itself questioning the validity of the mean as a descriptive statistic in this context. As will be shown, vast amount of variation presents a trend for most statistical measures obtained in this thesis, and this will naturally have adverse effects on the statistical significance of results.

One is reminded that the average sentence level statistic is formulated by grading each sentence for its informative quality. In other words, the main aggregate measure for the quality of a sustainability disclosure is the average rate at which sentences provide

useful, comparable information. The average quality score for analyzed disclosures is 1,35 points out of 4. At first glance, the average quality score seems surprisingly low. The average scores of reports were double checked via a manual inspection with a somewhat rudimentary scoring system for quality. It was attempted to loosely imitate the functions of the software; reports were subjectively analyzed based on the parameters of the software; scores would be given on a basis of *excellent/good/decent/poor*[20]. The manual inspection suggested that reports which were perceived as *excellent* or *good* scored between 1,9 and 2,2 in software analysis, whereas poor documents only reached a score of 1 to approximately 1,2. Therefore, it was determined that a reasonably high-quality report will likely score between 1,6 and 2,2 points on this grading system.

The reason for seemingly low scores lies in the design of the quality assessment model: a sentence will only obtain a high score if it contains A) a specific GRI key phrase, B) a year-to-year comparative measure and C) a numeric quantifier. Reports will inherently have a descriptive element to them – which makes them pleasant to read – and this arguably explains why reports fail to score high points. After all, it is not reasonable to assume that a report, ranging from 5 to 50 pages long, would only incorporate sentences which contain all of the mentioned indicators of informative quality. It is hypothesized, that in using the proposed model for analyzing quality, scores of 2,5 or more would mostly be present in short, condensed accounts on sustainability-related factors (e.g., *snapshots* of performance) – not entire reports. This is to say that long documents, which score in the realm of 3+ out of four, will likely be deemed unreadable by scholars and stakeholders alike, due to their intensely laborious nature in terms of consumption.

Therefore, the average score obtained in analysis seems reasonable. What this does highlight, though, is the fact that for a majority of corporations, the bulk of a

[20] Note: the aim of this exercise was to calibrate expectations when it came to assessing the quality scores of reports. What is important to understand, is that what is considered "good" in this context, will likely not be equivalent to what is generally perceived as a "good" quality report. The reason for this is to attempt to address quality-factors in the same manner as the software model proposed in this thesis, i.e. quality scores are based on the informative qualities of a sentence, and overall quality arises from the perception that a high number of sentences contain aforementioned measures of quality.

sustainability report is often made up of descriptive, incomparable statements, which provide little value for investors. As such, this is not surprising, given that sustainability reports are often perceived as a form of *greenwashing*. This notion is somewhat supported by theory: given that most theories – legitimacy and stakeholder theory, to name a few – suggest that companies will use sustainability reporting as a tool to mitigate adverse effects arising from the questionable practices they engage in, it seems logical that companies would A) do their best to provide descriptive, embellishing statements and B) refrain from providing stakeholders with comparable data in unfavorable situations.

On average, each analyzed document contained *120* level one sentences, *15* level two sentences, *10* level three sentences and approximately *7* level four sentences. Once again, the obtained results deviate significantly from the mean. As such, the significance of these findings must be questioned, but what can certainly be deduced, is that there is extreme variance in the levels of sustainability reporting present in Finnish listed companies.

Finally, *"covered sections (%)"* indicates the proportion of GRI items disclosed in the report in hand. One is reminded that this statistic acts as a checklist, one that provides an indication of the 'true' quantity of sustainability disclosures in a given report. That is to say, while the length of report offers a general understanding of the breadth of a report, the variable *covered sections* indicates how many of the required items have indeed been disclosed – and the derived percentage indicates the proportion of requirements met. Once more, variation is high, with the best companies covering 82% of requirements, and some failing to meet any standards when it comes to sustainability reports. Perhaps the most surprising detail regarding compliance to the requirements is that although the sample included several reports which were made according to GRI framework, not a single company disclosed all required items.

It is easy to point to the key phrase list at this point as the reason for a lack of coverage. After all, key phrases that are strongly based on a single framework, will inherently favor GRI-based reports over reports made according to other frameworks. However, this thesis argues that this is likely not a case of biased or inaccurate methods of analysis. The reasoning for this is straightforward: the chosen keywords are ones

which arguably should be present in *any* decent sustainability report. In other words, the chosen key words are searched for in no format-bound way whatsoever, and these represent items that are likely considered as essential for comprehensive sustainability disclosures. For example, in disclosing ozone depletion-related issues, it is highly likely – and generally desirable – that companies utilize either of the two key phrases used to indicate whether GRI 305-6 (emissions of ozone-depleting substances) has indeed been disclosed as per requirements:

cfc.11|trichlorofluoromethane

\sods\s|ozone deplet[a-z]{1,3}

305-6

Therefore, this thesis posits that reason for low scores is due to companies failing to disclose sustainability matters at adequate levels, rather than biased methods of analysis. Additionally, what was surprising, but backs this notion, is the fact that even companies, which provided reports based on GRI, failed to cover all sections of the framework. Based on this sample, subjectively speaking[21], satisfactory and good reports score approximately 50% to 75% in coverage, respectively.

5.2.2 Distribution of data

As is likely evident from presented statistical measures, obtained results vary significantly. Both quantity scores – *sentences*, *words* and *covered sections* – and quality scores – *average sentence level* – present widely erratic results, which may prove challenging in further analysis.

All measures of quantity are positively skewed. Perhaps most telling, is that quantity measures, which could be classed as simplistic – e.g., sentence or word count – are exceedingly skewed. Positively skewed findings suggest that the bulk of obtained data points occupy the lower parts of the sample range. This is also supported the fact that

[21] As per the manual assessment described earlier.

both median and mode values for said data points preside significantly lower than the mean. Finally, the range of said data points is extremely wide. Based on the distribution of quantity-related data, it seems likely that there is a harsh divide between the *'have's'* and *'have not's'* – i.e., companies which choose to disclose sustainability-related issues at high levels, and those which don't – in that a vast majority of companies report at visibly poor levels, and the average level of reporting is brought up by a small number of statistical outliers, which report at exceptional levels.

Quality-related data is relatively less skewed, as is data on section coverage. However, all obtained data presents itself as rather heavily leptokurtic, indicating a high frequency of significant outliers in the data. Again, based on manual verification, this is not, as such, surprising due to the significant divide between poor and great reporters.

Based on descriptive statistics, it can be suggested that fitting the obtained data into a linear model will be challenging. One is reminded that linear models require normally distributed variables, and none of the presented measures seem to be normally distributed.

5.3 Test of hypotheses

As it appears, based on descriptive statistics, the obtained data is rather unevenly distributed. Dependent variables are 'covered sections' and 'average sentence level'. Optimally, it was determined, that variables should be linearly regressed. Linear regression requires normal distribution and so, a visual inspection of data was made.

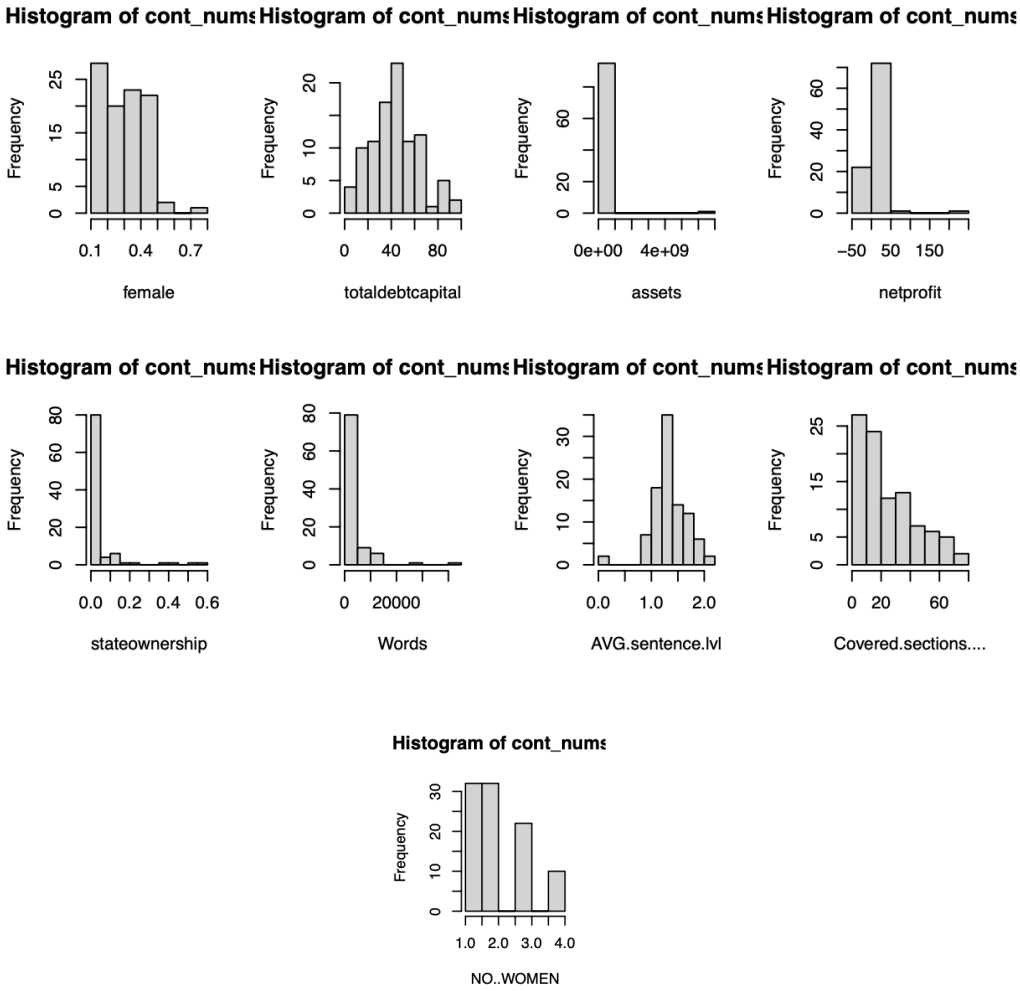

Table 6, histogram of data distribution

As is evident from a visual inspection, data is not normally distributed. In an attempt to create a model for predicting these relationships, logarithmic transformation was done in order to normalize variables. Outliers – and most importantly, datapoints whose values are zero – were also eliminated from the set.

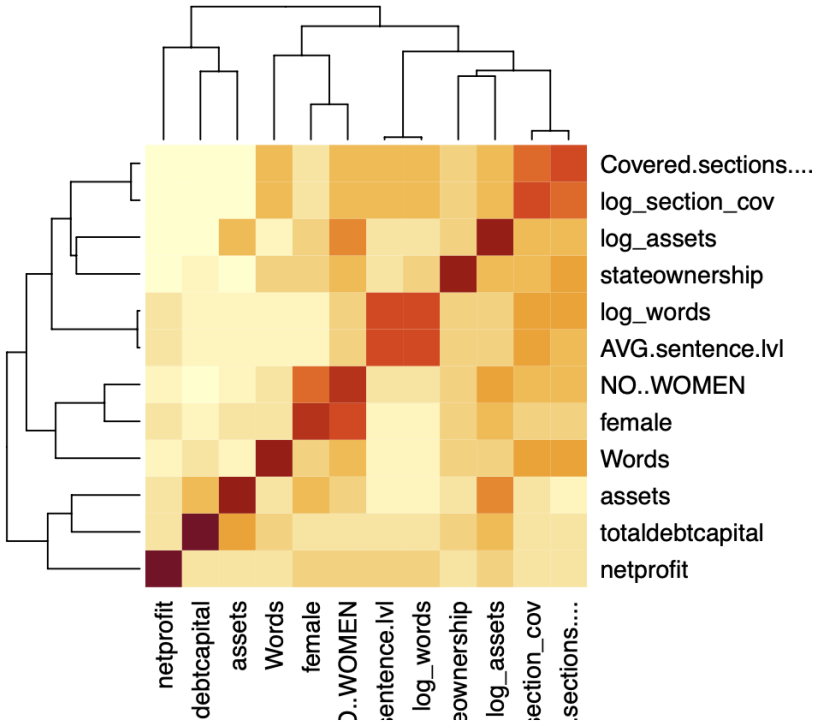

Figure 4, heatmap of correlation matrix of variables

Above is a heatmap generated on the basis of a correlation matrix[22] on continuous dependent and independent variables. While there is evidence for some, relatively weak relationships – for example number of women board members and state ownership (0,39) – no such evidence is found between dependent and independent variables.

Finally, several possible models were tested in an attempt to predict the relationships between the variables that showed some correlation.

Model 1, Average sentence level – assets, state ownership & number of women:

```
mod = lm(AVG.sentence.lvl ~ log_assets + stateownership+ NO..WOMEN, data = cont_nums)
summary(mod)
```

[22] Please refer to appendix 5 for full correlation matrix.

Where continuous independent variables – assets, state ownership and number of female board members – predict the average sentence level of a report.

```
lm(formula = AVG.sentence.lvl ~ log_assets + stateownership +
    NO..WOMEN, data = cont_nums)

Residuals:
     Min       1Q   Median       3Q      Max
-0.44503 -0.16056 -0.04932  0.12663  0.77771

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.045986   0.180023   5.810 1.12e-07 ***
log_assets     0.025784   0.015633   1.649    0.103
stateownership 0.214422   0.274944   0.780    0.438
NO..WOMEN      0.004658   0.034445   0.135    0.893
---
Signif. codes:  0 ’***’ 0.001 ’**’ 0.01 ’*’ 0.05 ’.’ 0.1 ’ ’ 1

Residual standard error: 0.2444 on 83 degrees of freedom

Multiple R-squared:  0.07845,    Adjusted R-squared:  0.04514
F-statistic: 2.355 on 3 and 83 DF,  p-value: 0.07782
```

Model 2, Section coverage – assets, state ownership and number of women:

```
mod = lm(log_section_cov ~ log_assets + stateownership + NO..WOMEN, data = cont_nums)
summary(mod)
```

Where assets, state ownership and number of female board members predict the dependent variable, GRI section coverage.

```
Residuals:
    Min      1Q  Median      3Q     Max
-2.2372 -0.4717  0.1862  0.4969  1.2584

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.35759    0.53154   2.554   0.0125 *
log_assets     0.09131    0.04616   1.978   0.0512 .
stateownership 1.31772    0.81180   1.623   0.1083
NO..WOMEN      0.18108    0.10170   1.781   0.0787 .
---
Signif. codes:  0 ’***’ 0.001 ’**’ 0.01 ’*’ 0.05 ’.’ 0.1 ’ ’ 1

Residual standard error: 0.7217 on 83 degrees of freedom
Multiple R-squared:  0.2553, Adjusted R-squared:  0.2283
F-statistic: 9.483 on 3 and 83 DF,  p-value: 1.868e-05
```

Model 3, Section coverage – assets and number of women:

```
mod = lm(log_section_cov ~ log_assets + NO..WOMEN, data = cont_nums)
summary(mod)
```

```
Residuals:
    Min      1Q  Median      3Q     Max
-2.3403 -0.5046  0.2174  0.4717  1.2186

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.15545    0.52175   2.215   0.0295 *
log_assets   0.10372    0.04596   2.257   0.0266 *
NO..WOMEN    0.22007    0.09978   2.205   0.0302 *
---
Signif. codes:  0 ’***’ 0.001 ’**’ 0.01 ’*’ 0.05 ’.’ 0.1 ’ ’ 1

Residual standard error: 0.7287 on 84 degrees of freedom
Multiple R-squared:  0.2316, Adjusted R-squared:  0.2133
F-statistic: 12.66 on 2 and 84 DF,  p-value: 1.564e-05
```

Model 1 is unable to provide statistically significant results with a p-value of 0,078. Additionally, all variables in the model fail in rejecting the null hypothesis at 95% confidence. Models 2 and 3 offer statistically significant predictions at a 95% confidence interval. However, while both models are statistically significant as a whole, some multicollinearity is evident between the coefficients in model 2. None of the independent variables in the model are able – on their own – to provide statistically significant results, in that all of their P-values exceed 0,05.

Taking a deeper look at model 3, it is found that both variables offer statistically significant results, as does the model as a whole. Therefore, it has to be concluded that while the explanatory nature ($R^2 = 0{,}2316$) and magnitude of the observed relationship is weak, both size and the number of female board members are positively related to the extent to which a company discloses items required by GRI. Hence, hypotheses H1a and H3a are confirmed, as the null hypotheses can be rejected. However, hypotheses H1b-H2b and H3b-H7b are rejected. The findings are in line with previous literature and are theoretically backed. According to the stakeholder theory and legitimacy theory, firm size tends to result into more scrutiny as well as increasingly heterogeneity in stakeholder needs, which is likely to result into increased reporting throughout.

While not surprising – as the hypothesis is theoretically sound – it is certainly notable, that female board membership has an effect on sustainability reporting quantity based on this data. It has to be stated, though, that the relationship might very well be more complicated than what is suggested theoretically, and should be studied further, in order to validate and quantify the effect to a higher degree.

6 CONCLUSIONS, DISCUSSION & FUTURE RECOMMENDATIONS

6.1 Conclusions

First and foremost, this thesis set out to prove that it is indeed possible to analyze sustainability reports in an automated fashion, through a novel, Python-based software solution. Second, this thesis aimed to explore the factors which determine the level – quantity and quality – of environmental reporting among Finnish, listed corporations.

As is evident from previous chapters, the first goal of the thesis proves to be successful. The software created in this thesis is able to collect and analyze an extremely wide variety of valuable data on the from sustainability reports; it indeed proved to provide results that are **comparable, objective and verifiable.** The automated Python software created in this thesis assesses the subjectivity and possible inherent biases or skews of manual analysis. The software was kept simple and comprehensible for scholars who lack deep software development understanding, thus ensuring the replicability of the study. Finally, being a novel solution, it dives into somewhat new territories, and forms the backbone of the findings of this thesis, making the methodology of the study one of its main findings.

This thesis also studied the determinants of sustainability reporting quality and quantity in reference to Finnish listed companies. No statistically significant results were available in terms of the determinants of sustainability reporting quality. Therefore, all quality-related hypotheses are rejected. Based on the data, it cannot be determined, whether a relationship exists between size, leverage, growth, board composition and the quality of sustainability reporting. Thus, as far as the conclusions of this thesis go, the hypothesized determinants do not have an effect on quality.

The same can be said of the determinants of quantity, with the exception of size and board composition. On the basis of this research, both the size of a corporation, and the number of female board members are positively associated with the quantity of sustainability reporting of a company. This is in line with previous research, as well as theoretical suggestions, although the effects are smaller, and less significant than expected. Nevertheless, it can be stated, without a doubt, that this study successfully

addresses the intended research gap both geographically and in terms of focusing on environmental reporting.

6.2 Discussion

6.2.1 Triumphs, challenges and limitations

What is essential to note, is that the model proposed in this thesis is by no means perfect. It could be argued, that in the realm of sustainability reporting analysis frameworks, perfection is something that cannot, and likely should not be sought after. Rather, as is the case for this study, one should acknowledge that as long as analysis tools are designed in a manner that is sufficiently accurate, unbiased and objective, obtained results are likely to be valuable, despite shortcomings.

As stated in previous sections, one of the main findings of this thesis is the fact that there is tremendous variation in the ways and the extent to which companies disclose sustainability-related issues. Driven by this variation, a so-called *bare bones* approach was taken in generating the list of key phrases. What was found is that this form of text recognition is extremely effective and highly accurate, at least in the context of the environmental reports among Finnish listed companies. What this accentuates, is that while complicated software solutions may very well offer great results, it is not mandatory: at times, simple solutions are able to provide great results. Notable, though, is that even with a simple solution, *the design of the software itself is the greatest variable of them all*. It is of utmost importance to design word recognition frameworks so that they mitigate false positives while maintaining the ability to indicate matches for a wide range of grammatical variations on a disclosable item.

Perhaps the most significant underlying challenge regarding the content analysis framework, is that in assessing quality and quantity, one has to adopt two, fundamentally different points of focus for each. The challenge, therefore, is combining these two in a way that doesn't alter the results of the other. To elaborate, in analyzing the quantity of a report, all unnecessary and unrelated disclosures have to be discarded in order to ensure accurate results. On the other hand, in analyzing the quality or disclosures, one wants to take every single sentence and disclosure into

count in order to get an accurate representation of the quality of a given report. In doing so, both high-quality and low-quality sentences effect the quality of the disclosure, as is desirable.

What is not as such a limitation, but a factor that should be understood when assessing the conclusions of this thesis, is that the quality and quantity of a report do not go hand in hand. As a matter of fact, in the context of this thesis, these often have the opposite effect; to score high in terms of quality, a report has to be concise. More often than not, quality-wise, additional quantity is harmful, rather than beneficial. This is naturally a case of determining the scope and aims of the software: is it desirable to emphasize one of the measures over the other with the risk of skewing the results? Likely not, and in the context of this thesis, it was all about finding the balance between the two. That said, the implications of the design of the quality and quantity measures are that reports, which may be mostly high quality, but also include descriptive sections, such *comments from the CEO*, will ultimately likely fail to obtain a high score.

Furthermore, a disadvantage of the semi-automated style of study is that disclosing more than the required amount rarely heightens the results obtained for a company. However, what has to be understood, is that more often than not, once a company chooses to disclose on subjects which are not mandatory, the information value is rather low for scholars and investors alike. Sections like these are often descriptive and lack substance. These might, for example, comprise of case studies on certain accomplishments, comments from top management and vows for the future. At worst, these are blatant greenwashing, attempting to portray a desired image of the company to shareholders. At best, the informative qualities of the additional disclosures are questionable. Thus, adopting a strict quality measurement approach such as the one taken in this thesis such as these is somewhat justified.

Another, potentially insignificant limitation of the study was that all sustainability reports had to be extracted manually. Initially, it was planned that artificial intelligence could have been used to automatically extract these, but it was deemed unfit for the purpose of this study due to the amount of resources and man hours required to train the software to accurately identify the different sections of an end-of-year report.

Therefore, these were extracted manually – and as with all manual labor, one cannot dismiss the possible effects of human error. Therefore, it is possible that minor inaccuracies persist, particularly in word counts.

Finally, it should be stated at a general level, that it seems that the variation found among sustainability reports does – unfortunately – make certain types of reports difficult to analyze; be it manually, or automatically. Essentially, based on the research conducted for this thesis, there seem two types of reports:

1) **Clear, concise & verifiable (often standalone) reports**: it is clear, which section involves itself with sustainability. Necessary disclosures are listed in a clear, concise and comprehensive manner. Sections are easy to locate, and it is easy to determine which portion of the report focuses on a given area of corporate responsibility; social, governance, economic, environmental, etc. These types of reports are often divided into sub-sections based on the area of responsibility covered.
2) **Descriptive, unclear reports**: Often bundled up. Trying to paint a certain image. Not very informative – information value is low (substance-to-expletive ratio is low). Often unclear which portion of responsibility is being disclosed in a certain section of the report. Not concise, "*painting with a wide brush*", often focused on describing certain highlight-sustainability cases for the year.

Additionally, some companies do combine the two rather successfully. However, in a number of cases, the areas of responsibility were so heavily intertwined that it was impossible to distinguish the different factors from each other. For example, one of the studied companies structured their sustainability report through three commitments, all of which included social, economic and environmental aspects. What these types of reports result into is poor comparability and verifiability, as well as stark challenges in objectively analyzing the level of reporting – granted, though, these kinds of reports prove superior in literary terms. Specifically, with the approach taken in this thesis, where non-environmental information was discarded from analyzable documents before analysis, these types of reports may have affected the results due to inaccuracies in text pre-processing.

Therefore, it is argued that a clear distinction between the different sections of the report, as well as high coherency, increase the informativeness of the report. A clear divide between the sections of a sustainability report make it easier for investors and scholars alike to obtain the information needed to make decisions. After all, if it seems challenging for a scholar – studying the information disclosed in the report for the sake of plainly accessing the information – finding the information needed for decision-making is most certainly difficult for an investor who will, additionally aim to make solid judgements about the report. The most significant difficulties, in this case, lie in the fact that highly interconnected reports tend to also be the most descriptive, i.e., low in information value, or information concentration. Thus, while concise, quantifiable reports are rarely pleasant to read, they arguably provide more favorable results.

6.2.2 Sustainability reporting in general

One of the major challenges facing scholars studying sustainability reports is the spallation of available data. That is, available methods of analysis often fail to provide ground-breaking results due to the fact that the amount of variation in sustainability reports is tremendous. The significant levels of variation found in reports means that making clear-cut predictions of relationships is near impossible and this may limit scholars to purely studying reports in qualitative ways. For this thesis, an attempt was made to create a methodology which could analyze available data impartially, and with such simplicity that would make clear, distinct conclusions available. Unfortunately, this was not the case; as is evident from previous sections, the variability of data affected the results widely, even though the software itself proved most successful.

In fact, even though it is somewhat expected, the sheer amount of variation among the reports has to be characterized as surprising. It seems that the number of variables which affect the ways companies disclose sustainability-related matters is vast. Therefore, the predictive properties of models on sustainability reporting can be mostly be deemed poor. It can be argued, in the context of reporting research, that the methodology of a study is the most important factor in determining the relationships that are found between sustainability and its determinants. The number of variables affecting sustainability research – and the troublesome task of predicting their effects – is perhaps best demonstrated through anecdotal evidence acquired while conducting

this research. Company A's insider chose to comment on the findings of this thesis on the company's part; the – granted, subjective – reasoning for the high quantity and quality scores received by the company was that they had hired a new sustainability manager, who had been able to change the environmental course of the company. While this hasn't been verified, and provides no valuable information for the study, it highlights the fact that it may be futile to attempt to predict the level of sustainability reporting based purely on relatively macro-level factors such as company size and profitability. As sustainability reporting is still a relatively new field, these variables are unlikely to be of high importance when it comes to the factors determining the level of sustainability reporting; rather, it is often a case of arguably *trivial*, highly variable company specific factors, such as managerial changes or the priorities of board members, which will determine the outcome. It can, therefore, be argued that the disclosure of sustainability-related issues is not as such a business driver for many corporations, but rather, purely a responsibility, which is to be covered.

It should be noted that the findings are thus far in line with Raucci et al. (2018) suggestions, in that there is a huge number of factors to account for. To reiterate, Raucci et al. (2018) find that the level of sustainability reporting is determined by:

1) Business-specific factors, which are defined by – and within – the company in question,
2) Compliance with regulation; *coercive isomorphism*,
3) The imitation of peers, both company-level, and individual-level; *mimetic isomorphism* and
4) Compliance with societal values and norms; *normative isomorphism*.

This is not to say, that the theoretical suggestions used in previous research – for example, that leverage, size and industry affiliation – do not have an effect on sustainability reporting. However, this thesis argues, that the relationships which have been found previously are the aggregate results of smaller, more direct determinants of sustainability reporting. To elaborate, as no unified, mandatory framework for sustainability reporting exists, sustainability reporting practices tend to have more to do with the contingent parameters present in an organization, rather than aggregate-level determinants. For example, the effect that size has on sustainability reporting can

often be explained by the company facing more scrutiny, which leads them to emphasize ecological mindsets in recruiting, which affects operations as well as reporting, and so on. Similarly, while female board membership seems to have an effect on sustainability reporting, the effects can arguably be traced down to the individual decisions of management and personnel, rather than higher-level determinants. In essence, therefore, it has to be understood, that A) it is extremely challenging to explain the variation in sustainability reporting practices by using an overbearing, aggregate-level measure due to the sheer number of factors that have an effect and that B) while measures such as size, leverage and growth – high-level indicators, which, as such, do not affect the everyday operations of personnel – are perceived to have an effect, the changes in sustainability reporting are likely to have more to do with a multitude of individual-level decisions, than high-level indicators.

A consistent theme throughout the process of conducting this study, is that sustainability reporting practices – as a whole – remain rudimentary. In conducting this study, sample reports showed both positive and negative signals as to the reporting practices used in corporations. Among the positives, is that even though a vast majority of companies failed to disclose all required items, certain companies have begun openly disclosing and discussing the number items they have disclosed (per ESG requirements), as well as outlining the reasons for not disclosing others. While this is hardly optimal, it stands to show that transparency is beginning to increase when it comes to sustainability reporting, a field which has faced its fair share of harsh criticism.

On the other hand, in the context of this thesis, the inadequacies of said practices are highlighted by the fact that there is no coherence as to the way companies report across the spectrum. The very fact that the term "*spectrum*" has to be used to describe sustainability reporting practices – or lack thereof – accentuates that there is a dire need for a unified, orchestrated efforts to bring coherency into the scene. While government intervention rarely provides the optimal results, it could be argued that intervention through governmental policies may be necessary, in bringing sustainability reporting to a level where the comparability, legitimacy and consistency is at the same level as in financial reporting. Granted, the reasoning for such high levels of integrity in financial reporting stem mostly from the legislative boundaries that have

been laid on corporations – and one cannot argue that such a deep-rooted rationale for developing sustainability reporting exists – but it should be questioned, whether the present state is, in fact, satisfactory, or not.

6.2.3 Suggestions and final remarks

The final remarks and suggestions of this thesis are both skeptical and hopeful, at the same time. It is easy to see how the learnings of this study could be taken further, in automating content analysis practices – both in sustainability reporting, and other business fields. Specifically, in terms of this thesis, it seems imperative that a similar study should be conducted with an even larger sample. A sample of around hundred companies is unfortunately too small for discerning significant statistical relationships from data that resembles a *Jackson Pollock painting* when the relationships are plotted for correlation. The straight-forward implications of repeating this study are two-fold. Firstly, in order to be able to manage a significantly larger sample, the prospect of utilizing machine learning for the extraction and pre-processing of sustainability reports should be entertained. Secondly, the sample should most likely consist of international companies from various geographical locations; the effects of the nationality of companies should be studied, as these might offer valuable insight – for example in the extent of cultural and legal heterogeneity. The challenge of analyzing the obtained data and fitting it into a model has to be seen as a challenge for future studies. Finally, it should be noted that the simplistic model for assessing the informative value of statements proposed in this thesis may also prove useful in other settings. The framework offers a solution that is easily adaptable to other settings via alterations to the list of key phrases.

What is also promising, is the sheer amount of data available through the software solution provided in this thesis. The 43 distinct metrics on reporting performance offer a plethora of possibilities for scholars and investors alike to dig deep into the realm of reports, far beyond kind words and expletives. What would seem like an excellent course of future research would be to take some of the obtained metrics, and study these individually. Suggestions for future studies include, for example:

- Studying how certain determinants effect the rate to which companies report on one environmental factor over another,
- Exploring, whether clusters could be found among the data, through ranking based on any of the metrics, and
- Comparing subjective perceptions of quality to the objective, software-based measure for quality.

In terms of macro-level business suggestions, it is challenging to offer new insight for the field, apart from the possible applications of the software solution. The cry for increased regulation, some form of unification and the prospect of increased sustainability performance comparability is well documented. In ways, therefore, the discussion and conclusions of this thesis can be characterized as a *broken record*, in that one remains hopeful, but waiting for important developments in the field.

LIST OF REFERENCES

Alazzani, A., & Wan-Hussin, W. (2013). Global Reporting Initiative's environmental reporting: A study of oil and gas companies. *Ecological Indicators*, *32*, 19-24. https://doi.org/10.1016/j.ecolind.2013.02.019

Al-Tuwaijri, S., Christensen, T., & Hughes, K. (2004). The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach. *Accounting, Organizations And Society*, *29*(5-6), 447-471. https://doi.org/10.1016/s0361-3682(03)00032-1

Ameer, R., & Othman, R. (2012). Sustainability Practices and Corporate Financial Performance: A Study Based on the Top Global Corporations. *Journal Of Business Ethics*, *108*(1), 61-79. https://doi.org/10.1007/s10551-011-1063-y

Amran, A., & Haniffa, R. (2011). Evidence in development of sustainability reporting: a case of a developing country. *Business Strategy And The Environment*, *20*(3), 141-156. https://doi.org/10.1002/bse.672

Andrikopoulos, A., Samitas, A., & Bekiaris, M. (2014). Corporate social responsibility reporting in financial institutions: Evidence from Euronext. *Research In International Business And Finance*, *32*, 27-35. https://doi.org/10.1016/j.ribaf.2014.02.001

Artiach, T., Lee, D., Nelson, D., & Walker, J. (2010). The determinants of corporate sustainability performance. *Accounting & Finance*, *50*(1), 31-51. https://doi.org/10.1111/j.1467-629x.2009.00315.x

Asif, M., Searcy, C., Santos, P., & Kensah, D. (2012). A Review of Dutch Corporate Sustainable Development Reports. *Corporate Social Responsibility And Environmental Management*, *20*(6), 321-339. https://doi.org/10.1002/csr.1284

Azapagic, A. (2004). Developing a framework for sustainable development indicators for the mining and minerals industry. *Journal Of Cleaner Production*, *12*(6), 639-662. https://doi.org/10.1016/s0959-6526(03)00075-1

Beck, A., Campbell, D., & Shrives, P. (2010). Content analysis in environmental reporting research: Enrichment and rehearsal of the method in a British–German context. *The British Accounting Review*, *42*(3), 207-222. https://doi.org/10.1016/j.bar.2010.05.002

Bernardi, R. (2006). Associations between Hofstede's Cultural Constructs and Social Desirability Response Bias. *Journal Of Business Ethics*, *65*(1), 43-53. https://doi.org/10.1007/s10551-005-5353-0

Bernardi, R., & Threadgill, V. (2010). Women directors and corporate social responsibility. *Electronic Journal Fo Business Ethics And Organizational Studies*, *15*(2), 15-21. Retrieved 17 August 2020, from.

Bhatia, A., & Tuli, S. (2017). Corporate attributes affecting sustainability reporting: an Indian perspective. *International Journal Of Law And Management*, *59*(3), 322-340. https://doi.org/10.1108/ijlma-11-2015-0057

Bhatia, A., & Tuli, S. (2017). Corporate attributes affecting sustainability reporting: an Indian perspective. *International Journal Of Law And Management*, *59*(3), 322-340. https://doi.org/10.1108/ijlma-11-2015-0057

Blanco, E., Rey-Maquieira, J., & Lozano, J. (2009). THE ECONOMIC IMPACTS OF VOLUNTARY ENVIRONMENTAL PERFORMANCE OF FIRMS: A CRITICAL REVIEW. *Journal Of Economic Surveys*, *23*(3), 462-502. https://doi.org/10.1111/j.1467-6419.2008.00569.x

Boiral, O., & Henri, J. (2016). Is Sustainability Performance Comparable? A Study of GRI Reports of Mining Organizations. *Business & Society*, *56*(2), 283-317. https://doi.org/10.1177/0007650315576134

Boudreaux, D., Rao, S., Das, P., & Rumore, N. (2013). How Much Did The Gulf Oil Spill Actually Cost British Petroleum Shareholders?. *Journal Of International Energy Policy (JIEP)*, *2*(1), 15-22. https://doi.org/10.19030/jiep.v2i1.7891

Bouten, L., Everaert, P., Van Liedekerke, L., De Moor, L., & Christiaens, J. (2011). Corporate social responsibility reporting: A comprehensive picture?. *Accounting Forum*, *35*(3), 187-204. https://doi.org/10.1016/j.accfor.2011.06.007

Braam, G., Uit de Weerd, L., Hauck, M., & Huijbregts, M. (2016). Determinants of corporate environmental reporting: the importance of environmental performance and assurance. *Journal Of Cleaner Production*, *129*, 724-734. https://doi.org/10.1016/j.jclepro.2016.03.039

Brammer, S., & Pavelin, S. (2008). Factors influencing the quality of corporate environmental disclosure. *Business Strategy And The Environment*, *17*(2), 120-136. https://doi.org/10.1002/bse.506

Branco, M., & Rodrigues, L. (2008). Factors Influencing Social Responsibility Disclosure by Portuguese Companies. *Journal Of Business Ethics*, *83*(4), 685-701. https://doi.org/10.1007/s10551-007-9658-z

Broberg, P., Tagesson, T., & Collin, S. (2009). What explains variation in voluntary disclosure? A study of the annual reports of corporations listed on the Stockholm Stock Exchange. *Journal Of Management & Governance*, *14*(4), 351-377. https://doi.org/10.1007/s10997-009-9104-y

Cambridge Dictionary. GREENWASHING | meaning in the Cambridge English Dictionary. Dictionary.cambridge.org. (2020). Retrieved 8 November 2020, from https://dictionary.cambridge.org/dictionary/english/greenwashing.

Capelle-Blancard, G., & Laguna, M. (2010). How does the stock market respond to chemical disasters?. *Journal Of Environmental Economics And Management*, *59*(2), 192-205. https://doi.org/10.1016/j.jeem.2009.11.002

Castelo Branco, M., Delgado, C., Ferreira Gomes, S., & Cristina Pereira Eugénio, T. (2014). Factors influencing the assurance of sustainability reports in the context of the economic crisis in Portugal. *Managerial Auditing Journal*, *29*(3), 237-252. https://doi.org/10.1108/maj-07-2013-0905

Cho, C., & Patten, D. (2007). The role of environmental disclosures as tools of legitimacy: A research note. *Accounting, Organizations And Society*, *32*(7-8), 639-647. https://doi.org/10.1016/j.aos.2006.09.009

Ciocirlan, C., & Pettersson, C. (2012). Does Workforce Diversity Matter in the Fight against Climate Change? An Analysis of Fortune 500 Companies. *Corporate Social Responsibility And Environmental Management*, *19*(1), 47-62. https://doi.org/10.1002/csr.279

Clarkson, P., Fang, X., Li, Y., & Richardson, G. (2013). The relevance of environmental disclosures: Are such disclosures incrementally informative?. *Journal Of Accounting And Public Policy*, *32*(5), 410-431. https://doi.org/10.1016/j.jaccpubpol.2013.06.008

Clarkson, P., Li, Y., Richardson, G., & Vasvari, F. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations And Society*, *33*(4-5), 303-327. https://doi.org/10.1016/j.aos.2007.05.003

CLARKSON, P., OVERELL, M., & CHAPPLE, L. (2011). Environmental Reporting and its Relation to Corporate Environmental Performance. *Abacus*, *47*(1), 27-60. https://doi.org/10.1111/j.1467-6281.2011.00330.x

Cormier, D., Gordon, I., & Magnan, M. (2004). Corporate Environmental Disclosure: Contrasting Management's Perceptions with Reality. *Journal Of Business Ethics*, *49*(2), 143-165. https://doi.org/10.1023/b:busi.0000015844.86206.b9

Cowan, S., & Deegan, C. (2010). Corporate disclosure reactions to Australia's first national emission reporting scheme. *Accounting & Finance*, *51*(2), 409-436. https://doi.org/10.1111/j.1467-629x.2010.00361.x

Crowther, D. (2002). A social critique of corporate reporting. Aldershot.

Crowther, D. (2003). *Corporate social responsibility improves profitability*. Lecture, Department of Business Administration, University of Salamanca.

da Silva Monteiro, S., & Aibar-Guzmán, B. (2009). Determinants of environmental disclosure in the annual reports of large companies operating in Portugal. *Corporate Social Responsibility And Environmental Management*, *17*(4), 185-204. https://doi.org/10.1002/csr.197

Dagiliene, L. (2020). The research of corporate social responsibility disclosures in annual reports. *Inzinerine Ekonomika- Engineering Economics*, *21*(2), 197-204. https://doi.org/ISSN 1392 – 2785

de Villiers, C., & Marques, A. (2016). Corporate social responsibility, country-level predispositions, and the consequences of choosing a level of disclosure. *Accounting And Business Research*, *46*(2), 167-195. https://doi.org/10.1080/00014788.2015.1039476

Deegan, C., & Gordon, B. (1996). A Study of the Environmental Disclosure Practices of Australian Corporations. *Accounting And Business Research*, *26*(3), 187-199. https://doi.org/10.1080/00014788.1996.9729510

Deegan, C., Rankin, M., & Tobin, J. (2002). An examination of the corporate social and environmental disclosures of BHP from 1983-1997. *Accounting, Auditing & Accountability Journal*, *15*(3), 312-343. https://doi.org/10.1108/09513570210435861

Dilling, P. (2010). Sustainability Reporting In A Global Context: What Are The Characteristics Of Corporations That Provide High Quality Sustainability Reports An Empirical Analysis. *International Business & Economics Research Journal (IBER)*, *9*(1). https://doi.org/10.19030/iber.v9i1.505

DiMaggio, P., & Powell, W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, *48*(2). https://doi.org/10.2307/2095101

Dixon, R., Mousa, G., & Woodhead, A. (2004). The necessary characteristics of environmental auditors: a review of the contribution of the financial auditing profession. *Accounting Forum*, *28*(2), 119-138. https://doi.org/10.1016/j.accfor.2004.01.001

Donaldson, T., & Preston, L. (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *The Academy Of Management Review*, *20*(1), 65. https://doi.org/10.2307/258887

Dowling, J., & Pfeffer, J. (1975). Organizational Legitimacy: Social Values and Organizational Behavior. *The Pacific Sociological Review*, *18*(1), 122. https://doi.org/10.2307/1388226

Drobetz, W., Merikas, A., Merika, A., & Tsionas, E. (2014). Corporate Social Responsibility (CSR) Revisited: The Case of International Shipping. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2351542

Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy And The Environment*, *11*(2), 130-141. https://doi.org/10.1002/bse.323

Eisenhardt, K. (1989). Agency Theory: An Assessment and Review. *The Academy Of Management Review*, *14*(1), 57. https://doi.org/10.2307/258191

Elms, Johnson-Cramer, & Berman. (2011). *Stakeholder theory, published by Robert Phillips* (pp. 1-21). Edward Elgar.

Fernandez-Feijoo, B., Romero, S., & Ruiz-Blanco, S. (2014). Women on Boards: Do They Affect Sustainability Reporting?. *Corporate Social Responsibility And Environmental Management*, *21*(6), 351-364. https://doi.org/10.1002/csr.1329

Figge, F., Hahn, T., Schaltegger, S., & Wagner, M. (2002). The Sustainability Balanced Scorecard - linking sustainability management to business strategy. *Business Strategy And The Environment*, *11*(5), 269-284. https://doi.org/10.1002/bse.339

Font, X., Walmsley, A., Cogotti, S., McCombes, L., & Häusler, N. (2012). Corporate social responsibility: The disclosure–performance gap. *Tourism Management*, *33*(6), 1544-1553. https://doi.org/10.1016/j.tourman.2012.02.012

Fortanier, F., Kolk, A., & Pinkse, J. (2011). Harmonization in CSR Reporting. *Management International Review*, *51*(5), 665-696. https://doi.org/10.1007/s11575-011-0089-9

Freeman. (1982). Organizational life cycles and natural selection processes, via Research in organizational behavior, L Cummings & B Staw (pp. 1-32). JAI Press.

Gallego-Álvarez, I. (2012). Indicators for sustainable development: Relationship between indicators related to climate change and explanatory factors. *Sustainable Development*, *20*(4), 276-292. https://doi.org/10.1002/sd.483

Gamerschlag, R., Möller, K., & Verbeeten, F. (2010). Determinants of voluntary CSR disclosure: empirical evidence from Germany. *Review Of Managerial Science*, *5*(2-3), 233-262. https://doi.org/10.1007/s11846-010-0052-3

Glasbeek, H. (1988), The Corporate Social Responsibility Movement: The Latest in Maginot Lines to Save Capitalism, Dalhousie Law Journal, Vol.11, pp.363- 402.

Gopalakrishnan, K., Yusuf, Y., Musa, A., Abubakar, T., & Ambursa, H. (2012). Sustainable supply chain management: A case study of British Aerospace

(BAe) Systems. *International Journal Of Production Economics*, *140*(1), 193-203. https://doi.org/10.1016/j.ijpe.2012.01.003

Goyvaerts, J. (2016). *Regular Expression Tutorial - Learn How to Use Regular Expressions*. Web.archive.org. Retrieved 31 October 2020, from https://web.archive.org/web/20161101212501/http:/www.regular-expressions.info/tutorial.html.

Gray, R. (2005). Taking a long view on what we know about social and environmental accountability and reporting. *Electronic Journal Of Radical Organization Theory*, *9*(1). Retrieved 16 August 2020, from https://www.st-andrews.ac.uk/media/csear/discussion-papers/CSEAR_dps-socenv-longview.pdf.

Gray, R., Kouhy, R., & Lavers, S. (1995). Constructing a research database of social and environmental reporting by UK companies. *Accounting, Auditing & Accountability Journal*, *8*(2), 78-101. https://doi.org/10.1108/09513579510086812

Guthrie, J., & Mathews, M. R. (1985). Corporate social accounting in Australasia. In L. E. Preston (Ed.), Research in Corporate Social Performance and Policy (Vol. 7, pp. 251-277). Greenwich, CN: JAI Press. Research in Corporate Social Performance and Policy

Gurthie, J., Cuganesan, S., & Ward, L. (2007). Legitimacy theory a story of reporting social and environmental matters within the Australian food and beverage industry. *Proceedings Of The Fifth Asia Pacific Interdisciplinary Research In Accounting Conference*, 1-35. Retrieved 17 August 2020, from http://www.csringreece.gr/files/research/CSR-1290000469.pdf.

Guthrie, J., & Farneti, F. (2008). GRI Sustainability Reporting by Australian Public Sector Organizations. *Public Money & Management*, *28*(6), 361-366. https://doi.org/10.1111/j.1467-9302.2008.00670.x

Hackston, D., & Milne, M. (1996). Some determinants of social and environmental disclosures in New Zealand companies. *Accounting, Auditing & Accountability Journal*, *9*(1), 77-108. https://doi.org/10.1108/09513579610109987

Hahn, R., & Kühnen, M. (2013). Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research. *Journal Of Cleaner Production*, *59*, 5-21. https://doi.org/10.1016/j.jclepro.2013.07.005

Hahn, T., & Scheermesser, M. (2006). Approaches to corporate sustainability among German companies. *Corporate Social Responsibility And Environmental Management*, *13*(3), 150-165. https://doi.org/10.1002/csr.100

Hasseldine, J., Toms, J., & Massoud, H. (2007). Political, Social and Economic Determinants of Corporate Social Disclosure by Multi-national Firms in

Environmentally Sensitive Industries. *University Of York*. Retrieved 8 November 2020, from.

Hawley, A. (2020). Human Ecology, via the International Encyclopedia of Social Sciences, by David L. Sills (pp. 328-327). Macmillan.

Heikkilä, T. (2019). *Helsingin pörssin 20 vuoden tuotto ja johtopäätökset tuottokehityksestä - Sijoittaja.fi*. Sijoittaja.fi. Retrieved 8 November 2020, from https://www.sijoittaja.fi/124139/helsingin-porssin-20-vuoden-tuotto-ja-johtopaatokset-tuottokehityksesta/#:~:text=Helsingin%20p%C3%B6rssin%20vuotuistettu%206%2C1,johtaa%20pitk%C3%A4ss%C3%A4%20juoksussa%20hyv%C3%A4%C3%A4n%20lopputulokseen.

Hong, Y., & Andersen, M. (2011). The Relationship Between Corporate Social Responsibility and Earnings Management: An Exploratory Study. *Journal Of Business Ethics*, *104*(4), 461-471. https://doi.org/10.1007/s10551-011-0921-y

Hughes, S., Anderson, A., & Golden, S. (2001). Corporate environmental disclosures: are they useful in determining environmental performance?. *Journal Of Accounting And Public Policy*, *20*(3), 217-240. https://doi.org/10.1016/s0278-4254(01)00031-x

Hummel, K., & Schlick, C. (2016). The relationship between sustainability performance and sustainability disclosure – Reconciling voluntary disclosure theory and legitimacy theory. *Journal Of Accounting And Public Policy*, *35*(5), 455-476. https://doi.org/10.1016/j.jaccpubpol.2016.06.001

Hunter, L., Hatch, A., & Johnson, A. (2004). Cross-National Gender Variation in Environmental Behaviors*. *Social Science Quarterly*, *85*(3), 677-694. https://doi.org/10.1111/j.0038-4941.2004.00239.x

Hussain, N., Rigoni, U., & Orij, R. (2016). Corporate Governance and Sustainability Performance: Analysis of Triple Bottom Line Performance. *Journal Of Business Ethics*, *149*(2), 411-432. https://doi.org/10.1007/s10551-016-3099-5

Ilinitch, A., Soderstrom, N., & Thomas, T. (1998). Measuring corporate environmental performance. *Journal Of Accounting And Public Policy*, *17*, 383-408. https://doi.org/http://dx.doi.org/10.1016/S0278-4254(98)10012-1

Ioannou, I., & Serafeim, G. (2011). The Consequences of Mandatory Corporate Sustainability Reporting. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1799589

Jasch, C. (2000). Environmental performance evaluation and indicators. *Journal Of Cleaner Production*, *8*(1), 79-88. https://doi.org/10.1016/s0959-6526(99)00235-8

Jennifer Ho, L., & Taylor, M. (2007). An Empirical Analysis of Triple Bottom-Line Reporting and its Determinants: Evidence from the United States and Japan. *Journal Of International Financial Management & Accounting*, *18*(2), 123-150. https://doi.org/10.1111/j.1467-646x.2007.01010.x

Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal Of Financial Economics*, *3*(4), 305-360. https://doi.org/10.1016/0304-405x(76)90026-x

Kansal, M., Joshi, M., & Batra, G. (2014). Determinants of corporate social responsibility disclosures: Evidence from India. *Advances In Accounting*, *30*(1), 217-229. https://doi.org/10.1016/j.adiac.2014.03.009

Karaman, A., Kilic, M., & Uyar, A. (2018). Sustainability reporting in the aviation industry: worldwide evidence. *Sustainability Accounting, Management And Policy Journal*, *9*(4), 362-391. https://doi.org/10.1108/sampj-12-2017-0150

Karaman, A., Kilic, M., & Uyar, A. (2018). Sustainability reporting in the aviation industry: worldwide evidence. *Sustainability Accounting, Management And Policy Journal*, *9*(4), 362-391. https://doi.org/10.1108/sampj-12-2017-0150

Kılıç, M., & Uyar, A. (2014). The Impact of Corporate Characteristics on Social Responsibility and Environmental Disclosures in Turkish Listed Companies. *Corporate Governance*, 253-276. https://doi.org/10.1007/978-3-642-45167-6_14

Kiliç, M., Kuzey, C., & Uyar, A. (2015). The impact of ownership and board structure on Corporate Social Responsibility (CSR) reporting in the Turkish banking industry. *Corporate Governance: The International Journal Of Business In Society*, *15*(3), 357-374. https://doi.org/10.1108/cg-02-2014-0022

Kim, Y., Park, M., & Wier, B. (2012). Is Earnings Quality Associated with Corporate Social Responsibility?. *The Accounting Review*, *87*(3), 761-796. https://doi.org/10.2308/accr-10209

Kimberly, J., & Miles, R. (1980). *The Organizational life cycle*. Jossey-Bass Publishers.

Kolk, A., & Perego, P. (2010). Determinants of the adoption of sustainability assurance statements: an international investigation. *Business Strategy And The Environment*. https://doi.org/10.1002/bse.643

KPMG. (2017). *The road ahead*. The KPMG Survey of Corporate Responsibility Reporting. KPMG International.

Kudłak, R., Szőcs, I., Krumay, B., & Martinuzzi, A. (2018). The future of CSR - Selected findings from a Europe-wide Delphi study. *Journal Of Cleaner Production*, *183*, 282-291. https://doi.org/10.1016/j.jclepro.2018.02.119

Kuzey, C., & Uyar, A. (2017). Determinants of sustainability reporting and its impact on firm value: Evidence from the emerging market of Turkey. *Journal Of Cleaner Production*, *143*, 27-39. https://doi.org/10.1016/j.jclepro.2016.12.153

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (1998). Law and Finance. *Journal Of Political Economy*, *106*, 1113–1155. Retrieved 16 August 2020, from.

Labuschagne, C., Brent, A., & van Erck, R. (2005). Assessing the sustainability performances of industries. *Journal Of Cleaner Production*, *13*(4), 373-385. https://doi.org/10.1016/j.jclepro.2003.10.007

Laksmana, I., & Yang, Y. (2009). Corporate citizenship and earnings attributes. *Advances In Accounting*, *25*(1), 40-48. https://doi.org/10.1016/j.adiac.2009.02.001

Laplume, A., Sonpar, K., & Litz, R. (2008). Stakeholder Theory: Reviewing a Theory That Moves Us. *Journal Of Management*, *34*(6), 1152-1189. https://doi.org/10.1177/0149206308324322

Lattemann, C., Fetscherin, M., Alon, I., Li, S., & Schneider, A. (2009). CSR Communication Intensity in Chinese and Indian Multinational Companies. *Corporate Governance: An International Review*, *17*(4), 426-442. https://doi.org/10.1111/j.1467-8683.2009.00758.x

Legendre, S., & Coderre, F. (2012). Determinants of GRI G3 Application Levels: The Case of the Fortune Global 500. *Corporate Social Responsibility And Environmental Management*, *20*(3), 182-192. https://doi.org/10.1002/csr.1285

Leuz, C., & Wysocki, P. (2008). Economic Consequences of Financial Reporting and Disclosure Regulation: A Review and Suggestions for Future Research. *SSRN Electronic Journal*, *Unpublished work*. https://doi.org/10.2139/ssrn.1105398

Lindblom, C. (1994). “The Implications of Organizational Legitimacy for Corporate Social Performance and Disclosure. *Paper Presented To The Critical Perspectives On Accounting Conference, Accessed Via Gurthie, Cuganesan & Ward (2007)*, (New York). Retrieved 17 August 2020, from.

Liu, X., & Anbumozhi, V. (2009). Determinant factors of corporate environmental information disclosure: an empirical study of Chinese listed companies. *Journal Of Cleaner Production*, *17*(6), 593-600. https://doi.org/10.1016/j.jclepro.2008.10.001

Lo, S., & Sheu, H. (2007). Is Corporate Sustainability a Value-Increasing Strategy for Business?. *Corporate Governance: An International Review*, *15*(2), 345-358. https://doi.org/10.1111/j.1467-8683.2007.00565.x

Lourenço, I., & Branco, M. (2013). Determinants of corporate sustainability performance in emerging markets: the Brazilian case. *Journal Of Cleaner Production*, *57*, 134-141. https://doi.org/10.1016/j.jclepro.2013.06.013

Lungu, C., Caraiani, C., & Dascalu, C. (2011). RESEARCH ON CORPORATE SOCIAL RESPONSIBILITY REPORTING. *Amfiteatru Economic*, *8*(29), 117-131. Retrieved 16 August 2020, from https://www.researchgate.net/publication/227363710.

Lyon, T., & Maxwell, J. (2011). Greenwash: Corporate Environmental Disclosure under Threat of Audit. *Journal Of Economics & Management Strategy*, *20*(1), 3-41. https://doi.org/10.1111/j.1530-9134.2010.00282.x

M. Shamil, M., M. Shaikh, J., Ho, P., & Krishnan, A. (2014). The influence of board characteristics on sustainability reporting. *Asian Review Of Accounting*, *22*(2), 78-97. https://doi.org/10.1108/ara-09-2013-0060

M. Shamil, M., M. Shaikh, J., Ho, P., & Krishnan, A. (2014). The influence of board characteristics on sustainability reporting. *Asian Review Of Accounting*, *22*(2), 78-97. https://doi.org/10.1108/ara-09-2013-0060

M. Shamil, M., M. Shaikh, J., Ho, P., & Krishnan, A. (2014). The influence of board characteristics on sustainability reporting. *Asian Review Of Accounting*, *22*(2), 78-97. https://doi.org/10.1108/ara-09-2013-0060

Madsen, P. (2009). Does Corporate Investment Drive a “Race to the Bottom” in Environmental Protection? A Reexamination of the Effect of Environmental Regulation on Investment. *Academy Of Management Journal*, *52*(6), 1297-1318. https://doi.org/10.5465/amj.2009.47085173

MARSHALL, S., VAIMAN, V., NAPIER, N., TAYLOR, S., HASLBERGER, A., & ANDERSEN, T. (2010). The End of a "Period": Sustainability and the Questioning Attitude. *Academy Of Management Learning & Education*, *9*(3), 477-487. https://doi.org/10.5465/amle.2010.53791828

Martínez-Ferrero, J., Garcia-Sanchez, I., & Cuadrado-Ballesteros, B. (2015). Effect of Financial Reporting Quality on Sustainability Information Disclosure. *Corporate Social Responsibility And Environmental Management*, *22*(1), 45-64. https://doi.org/10.1002/csr.1330

McKinsey. (2020). *Women in the Workplace 2020*. McKinsey and Company. Retrieved from https://www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace

Meyer, J., & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal Of Sociology*, *83*(2), 340-363. https://doi.org/10.1086/226550

Milne, M., & Adler, R. (1999). Exploring the reliability of social and environmental disclosures content analysis. *Accounting, Auditing &*

Accountability Journal, *12*(2), 237-256. https://doi.org/10.1108/09513579910270138

Milne, M., Kearins, K., & Walton, S. (2006). Creating Adventures in Wonderland: The Journey Metaphor and Environmental Sustainability. *Organization*, *13*(6), 801-839. https://doi.org/10.1177/1350508406068506

Morhardt, J., Baird, S., & Freeman, K. (2002). Scoring corporate environmental and sustainability reports using GRI 2000, ISO 14031 and other criteria. *Corporate Social Responsibility And Environmental Management*, *9*(4), 215-233. https://doi.org/10.1002/csr.26

Nair, R., Muttakin, M., Khan, A., Subramaniam, N., & Somanath, V. (2019). Corporate social responsibility disclosure and financial transparency: Evidence from India. *Pacific-Basin Finance Journal*, *56*, 330-351. https://doi.org/10.1016/j.pacfin.2019.06.015

Nazari, J., Herremans, I., & Warsame, H. (2015). Sustainability reporting: external motivators and internal facilitators. *Corporate Governance: The International Journal Of Business In Society*, *15*(3), 375-390. https://doi.org/10.1108/cg-01-2014-0003

Neu, D., Warsame, H., & Pedwell, K. (1998). Managing Public Impressions: Environmental Disclosures in Annual Reports. *Accounting, Organizations And Society*, *23*(3), 265-282. https://doi.org/10.1016/s0361-3682(97)00008-1

Nobanee, H., & Ellili, N. (2016). Corporate Sustainability Disclosure in Annual Reports: Evidence from UAE Banks: Islamic Versus Conventional. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2970191

Olsthoorn, X., Tyteca, D., Wehrmeyer, W., & Wagner, M. (2001). Environmental indicators for business: a review of the literature and standardisation methods. *Journal Of Cleaner Production*, *9*(5), 453-463. https://doi.org/10.1016/s0959-6526(01)00005-1

Patten, D. (1991). Exposure, legitimacy, and social disclosure. *Journal Of Accounting And Public Policy*, *10*(4), 297-308. https://doi.org/10.1016/0278-4254(91)90003-3

Patten, D. (2002). The relation between environmental performance and environmental disclosure: a research note. *Accounting, Organizations And Society*, *27*(8), 763-773. https://doi.org/10.1016/s0361-3682(02)00028-4

Perrini, F., Russo, A., & Tencati, A. (2007). CSR Strategies of SMEs and Large Firms. Evidence from Italy. *Journal Of Business Ethics*, *74*(3), 285-300. https://doi.org/10.1007/s10551-006-9235-x

Petera, P., Wagner, J., Pakšiová, R., & Křehnáčová, A. (2019). Sustainability Information in Annual Reports of Companies Domiciled in the Czech Republic and the Slovak Republic. *Engineering Economics*, *30*(4), 483-495. https://doi.org/10.5755/j01.ee.30.4.22481

Plumlee, M., Brown, D., Hayes, R., & Marshall, R. (2015). Voluntary environmental disclosure quality and firm value: Further evidence. *Journal Of Accounting And Public Policy*, *34*(4), 336-361. https://doi.org/10.1016/j.jaccpubpol.2015.04.004

Raucci, D., & Tarquinio, L. (2015). A Study of the Economic and Non-Financial Performance Indicators in Corporate Sustainability Reports. *Journal Of Sustainable Development*, *8*(6), 216-230. https://doi.org/10.5539/jsd.v8n6p216

Raucci, D., Tarquino, L., & Benedetti, R. (2018). An Investigation of Global Reporting Initiative Performance Indicators in Corporate Sustainability Reports: Greek, Italian and Spanish Evidence. *Sustainability*, *10*(4), 19. https://doi.org/10.3390/su10040897

Reverte, C. (2009). Determinants of Corporate Social Responsibility Disclosure Ratings by Spanish Listed Firms. *Journal Of Business Ethics*, *88*(2), 351-366. https://doi.org/10.1007/s10551-008-9968-9

Roberts, R. (1992). Determinants of corporate social responsibility disclosure: An application of stakeholder theory. *Accounting, Organizations And Society*, *17*(6), 595-612. https://doi.org/10.1016/0361-3682(92)90015-k

Robertson, D., & Nicholson, N. (1996). Expressions of corporate social responsibility in U.K. firms. *Journal Of Business Ethics*, *15*(10), 1095-1106. https://doi.org/10.1007/bf00412050

Roca, L., & Searcy, C. (2012). An analysis of indicators disclosed in corporate sustainability reports. *Journal Of Cleaner Production*, *20*(1), 103-118. https://doi.org/10.1016/j.jclepro.2011.08.002

Sagiv, L., & Schwartz, S. (2007). Cultural values in organisations: insights for Europe. *European J. Of International Management*, *1*(3), 176. https://doi.org/10.1504/ejim.2007.014692

Salewski, M., & Zülch, H. (2013). The Impact of Corporate Social Responsibility (CSR) on Financial Reporting Quality – Evidence from European Blue Chips. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2141768

Samuel, V., Agamuthu, P., & Hashim, M. (2013). Indicators for assessment of sustainable production: A case study of the petrochemical industry in Malaysia. *Ecological Indicators*, *24*, 392-402. https://doi.org/10.1016/j.ecolind.2012.07.017

Schadewitz, H., & Niskala, M. (2010). Communication via responsibility reporting and its effect on firm value in Finland. *Corporate Social Responsibility And Environmental Management*, n/a-n/a. https://doi.org/10.1002/csr.234

Schaltegger, S., & Wagner, M. (2006). Integrative management of sustainability performance, measurement and reporting. *International Journal Of Accounting, Auditing And Performance Evaluation*, *3*(1), 1. https://doi.org/10.1504/ijaape.2006.010098

Shad, M., Lai, F., Shamim, A., & McShane, M. (2020). The efficacy of sustainability reporting towards cost of debt and equity reduction. *Environmental Science And Pollution Research*, *27*(18), 22511-22522. https://doi.org/10.1007/s11356-020-08398-9

Shocker, A., & Sethi, S. (1973). An Approach to Incorporating Societal Preferences in Developing Corporate Action Strategies. *California Management Review*, *15*(4), 67. https://doi.org/10.2307/41164466

Simnett, R., Vanstraelen, A., & Chua, W. (2009). Assurance on Sustainability Reports: An International Comparison. *The Accounting Review*, *84*(3), 937-967. https://doi.org/10.2308/accr.2009.84.3.937

Skouloudis, A., & Evangelinos, K. (2009). Sustainability reporting in Greece: Are we there yet?. *Environmental Quality Management*, *19*(1), 43-60. https://doi.org/10.1002/tqem.20235

Skouloudis, A., Evangelinos, K., & Kourmousis, F. (2010). Assessing non-financial reports according to the Global Reporting Initiative guidelines: evidence from Greece. *Journal Of Cleaner Production*, *18*(5), 426-438. https://doi.org/10.1016/j.jclepro.2009.11.015

Skouloudis, A., Jones, N., Malesios, C., & Evangelinos, K. (2014). Trends and determinants of corporate non-financial disclosure in Greece. *Journal Of Cleaner Production*, *68*, 174-188. https://doi.org/10.1016/j.jclepro.2013.12.048

Solidium Oy. (2020). *Solidium | Omistukset*. Solidium.fi. Retrieved 8 November 2020, from https://www.solidium.fi/fi/omistukset/salkku/.

Spence, C., Husillos, J., & Correa-Ruiz, C. (2010). Cargo cult science and the death of politics: A critical review of social and environmental accounting research. *Critical Perspectives On Accounting*, *21*(1), 76-89. https://doi.org/10.1016/j.cpa.2008.09.008

Stanny, E., & Ely, K. (2008). Corporate environmental disclosures about the effects of climate change. *Corporate Social Responsibility And Environmental Management*, *15*(6), 338-348. https://doi.org/10.1002/csr.175

Stewart, Allen, & Cavender. (1963). LRPS report no. 168. *Long Range Planning Service*, *Stanford Research Institute*. Retrieved 17 August 2020, from.

Suchman, M. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *The Academy Of Management Review*, *20*(3), 571. https://doi.org/10.2307/258788

TOMS, J. (2002). FIRM RESOURCES, QUALITY SIGNALS AND THE DETERMINANTS OF CORPORATE ENVIRONMENTAL REPUTATION: SOME UK EVIDENCE. *The British Accounting Review*, *34*(3), 257-282. https://doi.org/10.1006/bare.2002.0211

UNCTAD. Division on Investment, Technology and Enterprise Development. (2000). World investment directory : foreign direct investment, and corporate data. Volume 7, part 1, Asia and the Pacific, *7*(1). https://doi.org/19211124794 (v.7, pt.1)

Unerman, J. (2000). Methodological issues - Reflections on quantification in corporate social reporting content analysis. *Accounting, Auditing & Accountability Journal*, *13*(5), 667-681. https://doi.org/10.1108/09513570010353756

van der Laan Smith, J., Adhikari, A., & Tondkar, R. (2005). Exploring differences in social disclosures internationally: A stakeholder perspective. *Journal Of Accounting And Public Policy*, *24*(2), 123-151. https://doi.org/10.1016/j.jaccpubpol.2004.12.007

WADDOCK, S., & GRAVES, S. (1997). THE CORPORATE SOCIAL PERFORMANCE-FINANCIAL PERFORMANCE LINK. *Strategic Management Journal*, *18*(4), 303-319. https://doi.org/10.1002/(sici)1097-0266(199704)18:4<303::aid-smj869>3.0.co;2-g

Yip, E., Van Staden, C., & Cahan, S. (2011). Corporate social responsibility reporting and earnings management: The role of political costs. *Australasian Accounting Business And Finance Journal*, *5*. Retrieved 16 August 2020, from.

Zeghal, D., & Ahmed, S. (1990). Comparison of Social Responsibility Information Disclosure Media Used by Canadian Firms. *Accounting, Auditing & Accountability Journal*, *3*(1). https://doi.org/10.1108/09513579010136343

7 APPENDICES

Appendix 1, outline of GRI:

GRI Section	Description	Subsections
GRI 1	Foundation	GRI 101: Foundation, GRI 102: General Disclosures & GRI 103: Management approach
GRI 2	Economic	GRI 201: Economic performance, GRI 202: Market presence, GRI 203: Indirect economic impacts, GRI 204: Procurement practices, GRI 205: Anti-corruption, GRI 206: Anti-competitive behavior
GRI 3	Environmental	GRI 301: Materials, GRI 302: Energy, GRI 303: Water and effluents, GRI 304: Biodiversity, GRI 305: Emissions, GRI 306: Effluents & waste, GRI 307: Environmental compliance, GRI 308: Supplier environmental assessment
GRI 4	Social	GRI 401: Employment, GRI 402: Labor/management relations, GRI 403: Occupational health and safety, GRI 404: Training and education, GRI 405: Diversity and opportunity, GRI 406: Non-discrimination, GRI 407: Freedom of association and collective bargaining GRI 408: Child labor, GRI 409: Forced or compulsory labor, GRI 410: Security practices GRI 411: Rights of indigenous peoples, GRI 412: Human rights assessment, GRI 413: Local communities, GRI 414: Supplier social assessment, GRI 415: Public Policy, GRI 416: Customer health and safety, GRI 417: Marketing and labeling, GRI 418: Customer privacy, GRI 419: Socioeconomic compliance

Appendix 2, excerpt from GRI 303-3, Water Withdrawal

The reporting organization shall report the following information:

1. *Total water withdrawal from all areas in megaliters, and a breakdown of this total by the following sources, if applicable:*
    i. *Surface water;*
    ii. *Groundwater;*
    iii. *Seawater;*
    iv. *Produced water;*
    v. *Third-party water.*
2. *Total water withdrawal from all areas with water stress in megaliters, and a breakdown of this total by the following sources, if applicable:*
    i. *Surface water;*
    ii. *Groundwater;*
    iii. *Seawater;*
    iv. *Produced water;*
    v. *Third-party water, and a breakdown of this total by the withdrawal sources listed in i-iv.*
3. *A breakdown of total water withdrawal from each of the sources listed in Disclosures 303-3-a and 303-3-b in megaliters by the following categories:*
    i. *Freshwater (≤1,000 mg/L Total Dissolved Solids);*
    ii. *Other water (>1,000 mg/L Total Dissolved Solids).*
4. *Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used.*

(Global Reporting Initiative, 2018)

Appendix 3, CONI information content scale (Boutena et al. 2010)

Disclosure Type	Definition	Examples
1	Disclosure addresses issue related to category definition; pure narrative	"With us environmental protection is more than merely the fulfilment of legal requirements." (KarstadtQuelle, 2000:51) "Reckitt Benckiser is committed to running its business in a responsible, environmentally sound and sustainable manner." (Benckiser, 2000:23)
2	Disclosure addresses issue related to category and provides details; pure narrative	"We will work more closely with customers and suppliers to improve the recyclability of products and the efficiency of processes." (GKN, 2002:27). "Lufthansa is particularly committed to protecting the crane, which is the airline's emblem and an endangered species. Together with German Society for Nature Conservation (NABU) and the World Wildlife Fund Germany Lufthansa supports the national crane protection group "Kranichschutz Deutschland" which maintains a well-attended crane information and visitor centre in Groβ Mohrdorf in the eastern German state of Mecklenburg-Western Pomerania." (Lufthansa, 2002:48)
3	Disclosure addresses issue related to category in numerical way; purely quantitative	"Worldwide expenditure on environmental protection and safety in the year under review totalled roughly € 42 million." (Beiersdorf, 2002: 51) "We invested £45 million in upgrading environmental standards and deploying new systems and technology." (BT, 2004:13)
4	Disclosure addresses issue related to category in numerical way, including qualitative explanations; narrative and quantitative	"The double-skin facade means that around 20% less heating energy is needed compared with regular HVAC technology, and the use of cool ground water will reduce energy requirements in summer by around 30%." (Deutsche Post, 2002: 43) "The 240 acre Community Parkland we created at our Waterside offices, out of a former refuse tip, will be fully opened this summer. We have planted 60,000 new trees, cleaned out the 3 rivers running through it and have created 12 km of pathways. Education rangers are giving lessons on environmental and conservation issues using the Parkland." (British Airways, 2000:15) "During the 2001 financial year, we reduced the amount of copier paper we purchased by 290 tonnes, largely due to increased use of e-mail and the BT intranet." (BT, 2001:27)
5	Any numerical disclosure to the category including qualitative statements demonstrating year comparisons; narrative, quantitative and comparable	"Of the provisions for reclamation, 150 million in 2002 (2001: 151 million) is for potential damages arising from former hard coal mining activities and 176 million (2001: 99 million) for those from lignite mining." (E.ON, 2002: 137) "In 2003, our operating and maintenance costs in the field of environmental protection and safety totalled €76 m (2002: €74 m)." (Schering, 2004:50) "Significant environmental incidents arising directly from the Group's activities increased from 32 (2002/03) to 46 (2003/04), principally as a result of better monitoring in our UK Gas Distribution operations." (National Grid Transco, 2004:16)

Appendix 4. Key phrase list: outline of regex use and metacharacters in key phrase list.

Regex offers a plethora of various metacharacters that can be utilized to search for words, or a combination of different words with single search terms. This appendix outlines the legend for regex metacharacters, and the key phrase list that was used for the analysis.

|

- = OR
- Use case: “text | text1”. The term will indicate a match for either “text” or “text1”.

{n,n}

- Defines how many times a certain character (as preceded by this quantifier) should be matched.
  - i.e. “metacharacter” will be repeated **n to n times**.
- E.g. {0,2} = the function that the metacharacter preceding this (e.g. [a-z]) should be repeated 0, 1 or 2 times.

[a-z]

- Can be used to match any single alphabetic character in the range of A to Z a number (n) times.
- Use case: used to match different variations of a single word.
  - E.g. “recycl[a-z]{1,4}” = “recycl” + 1-4x any alphabetic character within the range.
  - i.e. this search term indicates matches for words such as ”recycle”, “recycled”, “recycling”, “recyclable”, and so on.

*****

- Matches as many characters as possible. Often succeeded by quantifier {n,n}.
- Use case: “text * text1” = “text + space” can be preceded by any number of characters within a sentence, and a match will be indicated as long as the sentence includes “space + text1” at some point.

.

Any character.

- Use case: “text.”. Indicating that this “text” can be followed by any character, whitespace, or not.
  - E.g. the software might treat punctuation differently from document to another. Therefore, “**.**” was used to ensure that hyphens, etc. were matched correctly → “market-based” = “market**.**based”.

()

- Similar to mathematical equations, everything inside brackets is its own entity and is assessed as one.

\s

- = whitespace character. I.e. space, tab, enter, etc.
- Use case: used for words, which might have prefixes or suffixes (which have to be distinguished from each other). Also for short words or abbreviations, which could be a part of another word if not separated.
    - E.g.1: "\sdirect\s" = "whitespace + direct + whitespace" → used to separate this from words, such as indirect.
    - E.g.2: "\sods\s" = "whitespace + ods +whitespace" → the letters "ods" might be a part of a longer word, which is totally unrelated to ozone depleting substances. Used to distinguish the two.

\d

- = any digit.
- Use case: "[number of] suppliers" → \d{1,4} suppl[a-z]{1,4}

Title	Keywords
301-1, Materials used	
	(sustainable|recycl[a-z]{1,4}|renewable|non-renewable) material[a-z]{0,1}
	packag[a-z]{1,3} material.
	material[a-z]{0,1} us[a-z]{1,3}
	material efficiency
	amount of.*consumed
	consumed.*of
	materials used by weight or volume
	material[a-z]{0,1} (renewable|non-renewable)
301-2, Recycled input materials	
	material[a-z]{0,1} recycl[a-z]{2,3}
	recycled input materials used
	recycled.*content.*used
	301-2
	recycl[a-z]{2,3} material[a-z]{0,1}
	input
301-3, Reclaimed products and their packaging materials	
	reclaimed products and their packaging materials
	reclaim[a-z]{0-3}
	301-3
302-1, Energy consumption within the organization	
	consum[a-z]{1,5} (in|within)
	consum[a-z]{1,5} (renewable|non-renewable|biofuel)
	(renewable|non-renewable|biofuel) (consum[a-z]{1,5}|electricity)
	district (cool[a-z]{0,3}|heat[a-z]{0,3})
	consum[a-z]{1,5} of (electri[a-z]{1,4}|hea[a-z]{1,4}|coo[a-z]{1,3}|steam|fuel)
	(electri[a-z]{1,4}|hea[a-z]{1,4}|coo[a-z]{1,3}|steam|fuel) consum[a-z]{1,5}
	(electri[a-z]{1,4}|hea[a-z]{1,4}|coo[a-z]{1,3}|steam) sold
	(renewable|non-renewable) energy

	energy (renewable|non-renewable)
	indirect energy
	sold (electri[a-z]{1,4}|hea[a-z]{1,4}|coo[a-z]{1,3}|steam)
	302-1
302-2, Energy consumption outside the organization	
	consum[a-z]{1,5} (out|outside)
	302-2
	(out|outside) consum[a-z]{1,5}
302-3, Energy intensity	
	energy intens[a-z]{1,3}
	ratio of energy intens[a-z]{1,3}
	energy intens[a-z]{1,3}
	intens[a-z]{1,3} of energy
	302-3
302-4, Reduction of energy consumption	
	energy (consum[a-z]{1,5}|us[a-z]{1,3})
	consum[a-z]{1,5} (of|in) energy
	302-4
	consum[a-z]{1,5} energy
302-5, reductions in energy requirements of products and services	
	reductions in energy requirements of products and services
	energy (requir[a-z]{2,6}|efficiency|saving[a-z]{0,1})
	302-5
	requir[a-z]{2,6} energy
	requir[a-z]{2,6} (of|for|in) energy
302-6, calculation methods for consumption	
	(average|avg) annual consumption
	consumption calculation[a-z]{0,1}
303-1 Interactions with water as a a shared resource	
	interactions with water as a shared resource
	water strateg[a-z]{1,3}
	water impact[a-z]{0,3}
	303-1
	interact[a-z]{0,4} with water
	water interact[a-z]{0,4}
	impact[a-z]{0,3} water
	impact[a-z]{0,3} on water
	water-related
	relat[a-z]{1,3} to water
	relat[a-z]{1,3} water
303-2, Management of discharge-related impacts	
	management of water discharge.related impacts
	effluent
	303-2
303-3, Water withdrawal	
	withdraw[a-z]{0,3}
	303-3
303-4, Water discharge	
	303-4
	discharg[a-z]{1,3}
	priorit[a-z]{1,4} substance[a-z]{0,1}

	substance[a-z]{0,1} of priority
303-5, Water Consumption	
	water consum[a-z]{1,5}
	303-5
	stress[a-z]{0,3} water
	water stor[a-z]{1,3}
	water-related
	relat[a-z]{1,3} to water
	water stress[a-z]{0,3}
	stor[a-z]{1,3} water
303-6, i.e. 303 general	
	stress[a-z]{0,1}
	surface water
	groundwater
	seawater
	produced water
	third-party water
	freshwater
304-1, Operational sites close to protected aras	
	operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas
	304-1
	high biodivers[a-z]{1,3}
	protect[a-z]{0,3} area[a-z]{0,1}
304-2, Activities impacting biodiversity	
	significant impacts of activities, products, and services on biodiversity
	impac[a-z]{1,4} on bioviders[a-z]{1,3}
	304-2
	invasive specie[a-z]{0,1}
	pest[a-z]{0,1}
	pathogen[a-z]{0,1}
304-3, Habitats Protected	
	habitat[a-z]{0,1} area[a-z]{0,1} (protect[a-z]{0,3}|restor[a-z]{1,5})
	304-3
	(protect[a-z]{0,3}|restor[a-z]{1,5}) habitat[a-z]{0,1}
	habitat[a-z]{0,1} (protect[a-z]{0,3}|restor[a-z]{1,5})
	(protect[a-z]{0,3}|restor[a-z]{1,5}) of habitat[a-z]{0,1}
	(protect[a-z]{0,3}|restor[a-z]{1,5}) of habitat[a-z]{0,1} area[a-z]{0,1}
304-4, Red List Species & conservation	
	iucn red list species and national conservation list species with habitats in areas affected by operations
	iucn
	304-4
	red list
	national conservation list
	endangered
	vulnerable
305-1, Direct scope 1 ghg emissions	
	305-1
	scope 1

	\sdirect\s
	biogenic
305-2, Energy indirect (scope 2) GHG emissions	
	305-2
	location.based
	energy indirect
	scope 2
	market.based
305-3, other indirect (scope 3) ghg emissions	
	305-3
	scope 3
	(other indirect) (ghg|greenhouse gas)
	indirect emissions
	biogenic
305-4, GHG emisisons intensity	
	emission[a-z]{0,1} intensity
	intensity.ratio
	(ghg|greenhouse gas) intensity
	305-4
305-5, reduction of ghg emissions	
	reduc[a-z]{1,4} (ghg|greenhouse gas)
	reduc[a-z]{1,4} (of|in|the|of the) (ghg|greenhouse gas)
	reduc[a-z]{1,4} emissions
	reduc[a-z]{1,4} (of|in) emissions
	emissions reduc[a-z]{1,4}
	(ghg|greenhouse gas) reduc[a-z]{1,4}
	305-5
305-6, emissions of ozone-depleting substances	
	cfc.11|trichlorofluoromethane
	\sods\s|ozone deplet[a-z]{1,3}
	305-6
305-7, Nox, sox and others	
	sox|sulfur oxide[a-z]{0,1}|sox
	significant air emission[a-z]{0,1}
	airborne emission[a-z]{0,1}
	305-7
	nox|nitrogen oxide[a-z]{0,1}|nox
	pop|persistent organic pollutant[a-z]{0,1}
	voc|volatile organic compund[a-z]{0,1}
	hap |hazardous air pollutant[a-z]{0,1}
	pm |particulate matter
305-8, i.e. 305 general	
	emission[a-z]{0,1} (target[a-z]{0,1}|report[a-z]{0,3}|data|factor[a-z]{0,1}|calculations)
	ch4|ch4
	n2o|n2o
	hfc.
	pfc.
	sf6|sf6
	nf3|nf3
	co2|carbon dioxide|co2
	emissions average
	ghg emission[a-z]{0,1}
	greenhouse gas emissions

	wltp
	gwp|global warming potential
	methane
	hydrofluorocarbon[a-z]{0,1}
	perfluorinated compound[a-z]{0,1}
	sulfur hexafluoride
	zero.emission
	emissions per ton[a-z]{0,2}
	nitrogen trifluoride
306-1, water discharge by quality and destination	
	water recycl[a-z]{1,3}
	recycl[a-z]{1,3} water
	by quality and destination
	discharge.
	306-1
306-2, waste type and disposal method	
	\shazardous waste[a-z]{0,1} treat[a-z]{0,4}
	treat[a-z]{0,4} of hazardous waste[a-z]{0,1}
	treat[a-z]{0,4} hazardous waste[a-z]{0,1}
	\shazardous waste[a-z]{0,1}
	non.hazardous waste[a-z]{0,1}
	non.hazardous waste treat[a-z]{0,4}
	treat[a-z]{0,4} of non.hazardous
	treat[a-z]{0,4} non. Hazardous
	wastewater
	incinerate.
	waste type
	waste handling
	recycling rate
	material waste
	306-2
	waste.{1,}recycled
	waste generated
	dispos[a-z]{2,} (by|of by)
306-3, significant spills	
	spill[a-z]{0,1}
	306-3
306-4, transport of hazardous waste	
	hazardous waste (transport[a-z]{0,3}|import[a-z]{0,3}|export[a-z]{0,3}|treat[a-z]{0,3}|ship[a-z]{0,4})
	(transport[a-z]{0,3}|import[a-z]{0,3}|export[a-z]{0,3}|treat[a-z]{0,3}|ship[a-z]{0,4}) of hazardous
	(transport[a-z]{0,3}|import[a-z]{0,3}|export[a-z]{0,3}|treat[a-z]{0,3}|ship[a-z]{0,4}) hazardous
	306-4
306-5, water bodies affected by water discharges	
	water bodies affected by water discharges (and|or) runoff
	(habitat[a-z]{0,1}|water bod[a-z]{1,3}) that are significantly affec[a-z]{1,4}
	(habitat[a-z]{0,1}|water bod[a-z]{1,3}) that are affec[a-z]{1,4}
	effect[a-z]{0,3} on (habitat[a-z]{0,1}|water bod[a-z]{1,3})
	effect[a-z]{0,3} (habitat[a-z]{0,1}|water bod[a-z]{1,3})
	(habitat[a-z]{0,1}|water bod[a-z]{1,3}) affec[a-z]{1,4}
	306-5

307-1, non compliance	
	with environmental laws and regulations
	\sfine[a-z]{0,1}
	non-compliance[a-z]{0,1}
	sanction[a-z]{0,1}
	307-1
308-1, suppliers screened	
	supplier[a-z]{0,1} that were screen[a-z]{0,2}
	supplier[a-z]{0,1} screen[a-z]{0,2}
	compliancy
	screen[a-z]{0,2} supplier[a-z]{0,1}
	308-1
308-2, negative environmental impacts in supply chain	
	308-2
	suppl[a-z]{1,4} (asses[a-z]{1,4}|identif[a-z]{1,4|audit[a-z]{0,2)
	\d{1,4} suppl[a-z]{1,4}
	(asses[a-z]{1,4}|identif[a-z]{1,4|audit[a-z]{0,2) suppl[a-z]{1,4}
	negative environmental impacts in the supply chain and actions taken

Appendix 5, correlation matrix of obtained variables

	female	totaldebtcapital	assets	netprofit	stateownership
female	1.00	-0.06	0.16	0.08	0.22
totaldebtcapital	-0.06	1.00	0.24	-0.08	-0.02
assets	0.16	0.24	1.00	0.00	-0.03
netprofit	0.08	-0.08	0.00	1.00	-0.05
stateownership	0.22	-0.02	-0.03	-0.05	1.00
Words	0.16	0.00	-0.05	-0.06	0.19
AVG.sentence.lvl	0.00	-0.11	-0.09	0.06	0.18
Covered.sections....	0.25	-0.12	-0.09	-0.06	0.41
NO..WOMEN	0.82	-0.06	0.10	0.09	0.39
log_assets	0.31	0.08	0.47	0.12	0.36
log_words	0.00	-0.11	-0.09	0.07	0.18
log_section_cov	0.21	-0.12	-0.07	-0.04	0.34

	Words	AVG.sentence.lvl	Covered.sections....	NO..WOMEN

female	0.16	0.00	0.25	0.82
totaldebtcapital	0.00	-0.11	-0.12	-0.06
assets	-0.05	-0.09	-0.09	0.10
netprofit	-0.06	0.06	-0.06	0.09
stateownership	0.19	0.18	0.41	0.39
Words	1.00	-0.10	0.44	0.23
AVG.sentence.lvl	-0.10	1.00	0.45	0.19
Covered.sections....	0.44	0.45	1.00	0.47
NO..WOMEN	0.23	0.19	0.47	1.00
log_assets	0.15	0.27	0.46	0.61
log_words	-0.13	0.99	0.47	0.20
log_section_cov	0.43	0.46	0.92	0.43

	log_assets	log_words	log_section_cov
female	0.31	0.00	0.21
totaldebtcapital	0.08	-0.11	-0.12
assets	0.47	-0.09	-0.07
netprofit	0.12	0.07	-0.04
stateownership	0.36	0.18	0.34
Words	0.15	-0.13	0.43
AVG.sentence.lvl	0.27	0.99	0.46
Covered.sections....	0.46	0.47	0.92
NO..WOMEN	0.61	0.20	0.43
log_assets	1.00	0.28	0.43
log_words	0.28	1.00	0.48
log_section_cov	0.43	0.48	1.00